

Catalogue of the Naturalized Flora of Taiwan

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ABSTRACT: This study was conducted in years 2000 to 2003 to compile a comprehensive list of naturalized species with background information, including origins, life forms, habits, usages, year of the first collection, and status. Major herbaria (TAI, HAST, TAIF, and NCKU) were visited to examine specimen records. Relevant publications and reliable websites and many other resources were also examined extensively for background information. Total 341 species in 222 genera and 60 families were documented as naturalized in Taiwan, representing 7.9% of the local flora. Besides, 25 species were considered as possibly naturalized due to insufficient evidences. A large portion (90.6%) of species reported here, were reported as “weeds” in other countries. Almost a half of the naturalized species (48.3%) were introduced from Americas.

KEYWORDS: Naturalized plant, Plant invasions, List, Taiwan.

INTRODUCTION

Despite the recent recognition of the impacts caused by invasive plants worldwide (Mooney and Hobbs, 2000; Vitousek *et al.*, 1997), there are still many regions in the world where basic information on naturalized plant taxa and plant invasions is only anecdotal or completely lacking, e.g. Asia and neighboring regions (Corlett, 1988; Meyer, 2000; Turner, 1995; Enmoto, 1999; Pandey, 2000). In Taiwan, although occasional attention has been paid to the naturalized plants (Chen and Wu 1997; Peng *et al.* 1998a, 1998b; Peng and Yang, 1998; Chen *et al.*, 1999; Kuoh and Chen, 2000; Chen and Wu, 2001; Yang, 2001; Yang and Peng, 2001), comprehensive studies on invasive species and plant invasions are still missing. Establishment of a database of naturalized species is the first step in the development of invasion biology, and will also serve as a stepping-stone for further detailed studies on the biology and impact of individual species (Wu *et al.*, 2003).

Naturalization has been recognized as the first phase of biological invasions. A naturalized species is defined as an introduced (non-native, exotic) species, that can consistently reproduce and sustain populations over many generations without (or despite) direct intervention by humans (Richardson *et al.*, 2000; Pyšek *et al.*, 2002, Wu *et al.*, 2003). After successful local establishment, some naturalized species disperse and produce viable offspring in areas distant from the sites of introduction. Such naturalized species are called “invasive” (Richardson *et al.*, 2000). Many invasive plant species cause economic and/or environmental damage, and are commonly referred to as exotic “pests” or “weeds” (Richardson *et al.*, 2000; Booth *et al.*, 2003).

Albeit that not every naturalized species will become invasive eventually, all the invasive species are naturalized first. This first list of naturalized species in Taiwan will serve as a foundation for future research on plant invasions in this country.

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MATERIALS AND METHODS

According to the Flora of Taiwan (Huang *et al.*, 1976, 1977, 1978, 1979, 1994, 1996, 1998, 2000 and 2003), a list of all species exotic to Taiwan, with each species designated as naturalized, escaped or persistent after cultivation, or invasive, was compiled for further examination. Species introduced or cultivated without any evidence of escaping were not considered. Other literature sources included relevant journal articles, as well as Hsu (1975), and Chen and Hu (1976), Kuo (1997), Yang *et al.* (1997), Liu *et al.* (1998), Yang *et al.* (1999), and Yang *et al.* (2001). Many other sources, such as Liu (1962), Yang (1982), Dodson *et al.* (1985), Lock (1989), Hatusima and Amano (1994), Berry *et al.* (1995), Wagner *et al.* (1999), Govaerts *et al.* (2000), Pyšek *et al.* (2002), personal field observations, and reliable website (http://www.hear.org/gcw/alpha_select_gcw.htm and <http://plants.usda.gov/index.html>) were also consulted for life forms, habits, native distributions, and status of naturalized species. The main herbaria in Taiwan (TAI, HAST, TAIF, and NCKU) were visited from 2000 to 2003, and information on the specimen labels of specimens of naturalized species was examined, including locality and year of collection. Species mentioned in literature as naturalized or escaped without a specimen or further field evaluation are considered as possible naturalized species, and are listed separately.

RESULTS

As a total, 341 species in 222 genera and 60 families were documented as naturalized in Taiwan (Table 1), not including 25 possible naturalized species (Table 2), representing 7.9% of the flora of Taiwan. Of the naturalized species 273 are dicotyledons, 67 are monocotyledons, and only one is a Pteridophyte. Of 341 species, 310 (90.9%) have been reported as “weeds” from some other countries (Randall, 2002). Almost a half of the naturalized species (48.3%) were introduced from Americas.

Finally, it should be stressed that this list is rather inclusive, as several taxa labeled as rare (R) and probably many species with unknown status (Table 1) are in fact just casual alien species (Richardson *et al.*, 2000) and not fully naturalized taxa.

Table 1. List of naturalized species.

Species	Origin	LF	HA	U	Y	S	W	RE
Pteridophyta								
Adiantaceae								
<i>Pityrogramma calomelanos</i> (L.) Link	Tropical America	H	P		1968	R		
Angiosperms								
Dicotyledons								
Acanthaceae								
<i>Blechnum pyramidatum</i> (Lam.) Urban.	Tropical America	H	P		1896	R		
Aizoaceae								
<i>Trianthema portulacastrum</i> L. (<i>Trianthum portulacastrum</i> L.)	Tropical Africa and Asia	H	P		1930	C	+	
Amaranthaceae								
<i>Alternanthera bettzickiana</i> (Regel) Nichol森	Brazil	H	P		1928	C	+	
<i>Alternanthera paronychioides</i> St. Hil.	Tropical America	H	P		1969	R	+	
<i>Alternanthera philoxeroides</i> Griseb.	Tropical America	H	P		1934	C	+	
<i>Amaranthus lividus</i> L.	Tropical Africa and Asia	H	A		1965	R	+	
<i>Amaranthus patulus</i> Betoloni	Tropical America	H	A		1934	I	+	
<i>Amaranthus spinosus</i> L.	Tropical America	H	A		1864	I	+	1

Species	Origin	LF	HA	U	Y	S	W	RE
<i>Amaranthus viridis</i> L.	Tropical America	H	A		1864	I	+	1
<i>Celosia argentea</i> L.	Africa	H	A		1896	I	+	2
<i>Gomphrena celosioides</i> Mart.	South America	H	P		1969	I	+	
Anacardiaceae								
<i>Rhus succedanea</i> L. var. <i>dumoutieri</i> Kudo et Matura	China	T	P	O	1931	R		
Apocynaceae								
<i>Tabernaemontana pandacaqui</i> Poir.	Micronesia	S	P		1896	R		2
Asclepiadaceae								
<i>Asclepias curassavica</i> L.	Tropical America	H			1896	R	+	2
Basellaceae								
<i>Anredera cordifolia</i> (Tenore) van Steenis	Tropical America	V	P	O	1975	I		3
<i>Basella alba</i> L.	Tropical Africa	V	P	O	1888	I	+	1
Bombacaceae								
<i>Bombax malabarica</i> DC.	South Africa	T	P	O	1896	R	+	2
Boraginaceae								
<i>Heliotropium indicum</i> L.	Thailand, Southeast Asia	H	A		1888	R	+	1
<i>Heliotropium procumbens</i> Mill. var. <i>depressum</i> (Cham.) H. Y. Liu	South America	H	A/P		1979	R	+	
<i>Myosotis arvensis</i> (L.) Hill	Europe	H			2002	R	+	4
Callitricheaceae								
<i>Callitriche peploides</i> Nutt.	North America	H	A		1997	R		5
Campanulaceae								
<i>Hippobroma longiflora</i> (L.) G. Don	America	H	P		1974	R	+	
<i>Lobelia alsinoides</i> Lam. subsp. <i>hancei</i> (Hara) Lammers.	East Asia	H	P		1923	R		
<i>Triodanis biflora</i> (Ruiz & Pav.) Greene	America	H	A		1991	R	+	6
Capparaceae								
<i>Cleome rutidosperma</i> DC.	Tropical Africa	H	P		1961	R	+	
Caryophyllaceae								
<i>Arenaria serpyllifolia</i> L.	Europe	H	A/B		1908	R	+	
Chenopodiaceae								
<i>Chenopodium ambrosioides</i> L.	Mexico, Tropical America	H	A/P		1864	I	+	1
Compositae								
<i>Ageratina adenophora</i> (Spreng.) R. M.	Mexico	H	P		1987	L	+	7
<i>Ageratum conyzoides</i> L.	Tropical America	H	P		1903	I	+	
<i>Ageratum houstonianum</i> Mill.	Mexico, Tropical America	H	A	O	1926	I	+	
<i>Ambrosia artemisiifolia</i> L.	North America	H	A		1971	I	+	8
<i>Aster subulatus</i> Michaux var. <i>sandwicensis</i> (A. Gray) A. G. Jones	Hawaii	H	A		1982	R	+	
<i>Aster subulatus</i> Michaux	North America	H	A		1926	C		
<i>Bidens bipinnate</i> L.	North America	H	A		1904	R	+	9
<i>Bidens pilosa</i> L. var. <i>radiata</i> Sch.	North and Tropical America	H	A		1984	I	+	
<i>Calyptocarpus vialis</i> Less.	North America	H	P		1982	I	+	10
<i>Centratherum punctatum</i> Cass. subsp. <i>fruticosum</i> (Vidal) Kirkman	Philippines	H/S			1983	R	+	11
<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob.	Tropical America	H	P	M	1989	L	+	12
<i>Cichorium intybus</i> L.	Europe	H	P		1976	R	+	13
<i>Conyza bonariensis</i> (L.) Cronq.	South America	H	A/B		1904	C	+	9
<i>Conyza canadensis</i> (L.) Cronq. var. <i>pusilla</i> (Nutt.) Cronq.	North America	H	A		1981	R	+	
<i>Conyza canadensis</i> L. var. <i>canadensis</i> Cronq.	North America	H	A		1917	I	+	
<i>Conyza sumatrensis</i> (Retz.) Walker	South America	H	A		1927	I	+	
<i>Cosmos bipinnatus</i> Cav.	Mexico	H	A	O	1928	L	+	14
<i>Crassocephalum crepidioides</i> (Benth.) S. Moore	Tropical Africa	H	A		1966	I	+	
<i>Eclipta zippeliana</i> Blume	Malaysia, Philippines	H	A		1981	I		
<i>Elephantopus mollis</i> Kunth	Tropical America	H	P		1916	I	+	15
<i>Emilia fosbergii</i> Nicolson	Africa	H	A/B	O	1975	L	+	13
<i>Erechtites hieracifolia</i> (L.) Raf. ex DC.	North America	H	P		1939	C	+	
<i>Erechtites valerianaefolia</i> (Wolf ex Rchb.) DC.	South America	H	A		1964	I	+	
<i>Erigeron annuus</i> (L.) Pers.	North America	H	A/B		1966	C	+	
<i>Gaillardia pulchella</i> Foug.	North America	H	A	O	1930	L	+	
<i>Galinosoga parviflora</i> Cav.	Tropical America	H	A		1967	R	+	

Species	Origin	LF	HA	U	Y	S	W	RE
<i>Galinosoga quadriradiata</i> Ruiz & Pav.	Tropical America	H	A		1987	I	+	7
<i>Gnaphalium calviceps</i> Fernald.	South America	H	A		1998	I	+	
<i>Gnaphalium pensylvanicum</i> Willd.	Warm America	H	A		1987	I	+	
<i>Gnaphalium spicatum</i> Lam.	South America	H	P		1998	I	+	
<i>Gynura bicolor</i> (Roxb. & Willd.) DC.	Himalaya to China	H	P	F	1904	R	+	9
<i>Hypochoeris radicata</i> L.	Europe	H	P		1973	L	+	13
<i>Leucanthemum vulgare</i> H. J. Lam.	Europe	H	P	O	1928	L	+	
<i>Mikania micrantha</i> Kunth	Tropical America	V	P		2002	I	+	16
<i>Parthenium hysterophorus</i> L.	Tropical and South America	H	A		1986	I	+	17
<i>Pluchea carolinensis</i> (Jacq.) G. Don	Africa	S	P		1997	R	+	18
<i>Pluchea sagittalis</i> (Lam.) Gabera	South America	H	P		1998	I	+	18
<i>Pseudelephantopus spicatus</i> (Juss.) C. F. Baker	South America	H	P		1896	C	+	2
<i>Senecio vulgaris</i> L.	Europe and North Africa	H	A/B		1970	L	+	8
<i>Solidago altissima</i> L.	North America	H	P	O	1960	L	+	8
<i>Soliva anthmifolia</i> R. Br. <i>ex</i> Less.	South America	H	A		1927	C	+	
<i>Soliva pterosperma</i> (Juss.) Less	South America	H	A		1990	R	+	
<i>Sonchus asper</i> (L.) Hill	Europe	H	A		1981	R	+	
<i>Sonchus oleraceus</i> Linn.	Europe	H	A		1904	I	+	9
<i>Spilanthes acemella</i> (L.) Murr.	Tropical America	H	A		1904	R	+	9
<i>Synedralla nodiflora</i> (L.) Gaertn.	South America	H	A		1915	I	+	19
<i>Tithonia diversifolia</i> (Hemsl.) A. Gray	Mexico	H	P	O	1976	I	+	
<i>Taraxacum officinale</i> Weber	Eurasia	H	P		1976	I	+	13
<i>Tridax procumbens</i> L.	Tropical America	H	P		1936	I	+	
<i>Vernonia elliptica</i> DC.	South Asia	V	P		1995	R	+	7
<i>Wedelia trilobata</i> (L.) Hitchc.	Tropical America	H	P		1982	I	+	
<i>Xanthium strumarium</i> L.	Eurasia	H	A		1900	C	+	9
Convolvulaceae								
<i>Ipomoea alba</i> L.	Tropical America	V		O	1921		+	
<i>Ipomoea aquatica</i> Forsk.		V	A	F	1896	R	+	2
<i>Ipomoea cairica</i> (L.) Sweet	Tropical Asia	V	P		1896		+	2
<i>Ipomoea carnea</i> Jacq. subsp. <i>fastulosa</i> (Mart. <i>ex</i> Choisy) D. F. Austin	Tropical America	S	P		1928		+	14
<i>Ipomoea hederacea</i> (L.) Jacq.	Tropical America	H	A/B	O	1864		+	1
<i>Ipomoea hederifolia</i> L.	America	H	A		2000	R	+	20
<i>Ipomoea indica</i> (Burm. f.) Merr.	Micronesia	V			1907	I	+	19
<i>Ipomoea mauritiana</i> Jacq	Australia	H	P		1896	I	+	2
<i>Ipomoea nil</i> (L.) Roth.	South America	H	A/B	O	1921	I	+	
<i>Ipomoea quamoclit</i> L.	Tropical America	V	A	O	1896		+	2
<i>Ipomoea trifida</i> (Kunth) G. Don	Tropical America	V	A			R	+	
<i>Ipomoea triloba</i> L.	Tropical America	H			1939		+	
<i>Ipomoea wrightii</i> A. Gray	Tropical America	V	P		1984		+	21
<i>Jacquemontia tamnifolia</i> (L.) Griseb.	Tropical America	V	P				+	
<i>Merremia tuberosa</i> (L.) Rendle	Tropical America	L	P				+	
Crassulaceae								
<i>Bryophyllum pinnatum</i> (Lam.) Kurz	Tropical Africa	H	P	O	1887	R	+	1
<i>Sedum bulbiferum</i> Makino	South China and Japan	H	B		1986	R	+	
<i>Sedum mexicanum</i> Britt	Mexico and America	H	P	O	1932	R	+	
Cruciferae								
<i>Coronopus didymus</i> (L.) Smith	Europe	H	A		1972		+	22
<i>Eutrema japonica</i> (Miq.) Koidz.	Japan	H	P	F	1920	L		
<i>Lepidium virginicum</i> L.	North America	H	B		1950	I	+	
<i>Nasturtium officinale</i> R. Br.	Eurasia	H			1933		+	
<i>Rorippa austriaca</i> (Crantz) Besser	Europe	H			1990		+	5
<i>Rorippa palustris</i> (L.) Besser	North America	H	P		1988		+	
<i>Sisymbrium irio</i> L.	Eurasia	H	A/B				+	
<i>Sisymbrium orientale</i> Thunb.	Europe	H	A/B		1980		+	
Cucurbitaceae								
<i>Coccinia grandis</i> (L.) Voigt	Tropical Africa	V	P		1994	R	+	22
<i>Melothria pendula</i> L.	North America	V	P		2001	R	+	23
<i>Momordica charantia</i> L.	Palaeotropics	V		F	1916	R	+	15
Euphorbiaceae								
<i>Chamaesyce hyssopifolia</i> (L.) Small	North America	H	A		1987		+	

Species	Origin	LF	HA	U	Y	S	W	RE
<i>Chamaesyce maculata</i> (L.) Samll	North America	H	A/P		1988		+	
<i>Chamaesyce serpens</i> (H. B. & K.) Small	America	H	A/P		1987		+	
<i>Croton tiglium</i> L.	India, Malaysia, South China	S	P	M	1905	R	+	9
<i>Euphorbia cyathophora</i> Murr.	North America	H	P	O	1910	R	+	15
<i>Euphorbia heterophylla</i> L.	Tropical and South America	H	P	O	1984	F	+	
<i>Euphorbia peplus</i> L.	Mediterranean	H	A		1907		+	
<i>Euphorbia tirucalli</i> L.	Africa	S	P	O	1896	R	+	2
<i>Phyllanthus tenellus</i> Roxb.	America	H	A		1996		+	53
<i>Ricinus communis</i> L.	Tropical Africa	H	P	O	1900	I		9
<i>Triadica sebifera</i> (L.) Small (<i>Sapium sebiferum</i> (L.) Roxb.)	China	T	P	O	1897	R	+	
Fabaceae (Leguminosae)								
<i>Acacia farnesiana</i> (L.) Willd.	Tropical America	S	P	O	1904	R	+	9
<i>Aeschynomene americana</i> L.	America	H			1954	R	+	
<i>Albizzia lebeck</i> (L.) Benth.	Africa	T	P	O	1922	R	+	
<i>Alysicarpus rugosus</i> (Willd.) DC.	Tropical Africa	H	A		1984	R	+	24
<i>Alysicarpus vaginalis</i> (L.) DC. var. <i>taiwanensis</i> Yang.		H			1985	R	+	
<i>Astragalus sinicus</i> L.	Mainland China	H	B	F	1864	C	+	1
<i>Cajanus cajan</i> (L.) Millsp.	India	S	P	M	1886	R	+	1
<i>Calopogonium mucunoides</i> Desv.	Tropical America	H	A		1931	R	+	
<i>Canavalia ensiformis</i> DC.	Mexico and Brazil	H	A		1931	R	+	
<i>Centrosema pubescens</i> Benth.	South America	V	P	F	1962	C	+	
<i>Chamaecrista nictitans</i> (L.) Moench subsp. <i>patellaria</i> (DC. ex Collad.) H. S. Irwin & Barneby var. <i>glabrata</i> (Vogel) H. S. Irwin & Barneby	Tropical America	H	A/B		1910	R		
<i>Chamaecrista mimosoides</i> (L.) Green	India and South China	H	P		1900	R	+	9
<i>Clitoria falcata</i> Lam.	Tropical America	V	P		1989			
<i>Clitoria ternatea</i> L.	Tropical America	V	P		1906	C	+	9
<i>Crotalaria bialata</i> Schrank	Tropical Asia	H	A		1931	R	+	
<i>Crotalaria incana</i> L.	Tropical America	H	A		1931	L	+	
<i>Crotalaria micans</i> Link	South America	H	P		1931	I	+	
<i>Crotalaria pallida</i> Aiton var. <i>obovata</i> (G. Don) Polhill	South Africa	S	A		1906	I	+	9
<i>Crotalaria triquetra</i> Dalzell	Tropical Asia	H			1979	R		
<i>Crotalaria zanzibarica</i> Benth.	Africa	H	A/P		1931	I	+	
<i>Dalbergia sissoo</i> Roxb.	India	T	P	F	1916	R	+	
<i>Desmanthus virgatus</i> (L.) Willd.	Tropical America	S	P		1988	R	+	
<i>Desmodium intortum</i> (DC.) Urb.	Tropical America	H	P		1962		+	
<i>Desmodium purpureum</i> Fawc. & Rendle	West Indies	H	P		1930		+	
<i>Desmodium scorpiurus</i> (Sw.) Desv.	Tropical America	H	P		1915	C	+	
<i>Lablab purpureus</i> (L.) Sweet	Asia, China	H	A	F	1903		+	9
<i>Leucaena leucocephala</i> (Lam.) de Wit	Tropical America	T	P	O	1903	I	+	
<i>Macroptilium atropurpureus</i> (DC.) Urb.	Tropical America	H	P		1985	I	+	
<i>Macroptilium lathyroides</i> (L.) Urb.	Tropical America	H	A		1981	I	+	
<i>Medicago lupulina</i> L.	Europe	H	A	F	1903		+	9
<i>Medicago polymorpha</i> L.	Europe	H	A	F	1896		+	2
<i>Medicago sativa</i> L.	Europe	H	P	F	1931		+	
<i>Melilotus indicus</i> (L.) All.	Europe	H	B		1900	I	+	9
<i>Melilotus officinalis</i> (L.) Lam.	Europe	H	A/B	F	1984		+	
<i>Mimosa diplotricha</i> C. Wight ex Sauvalle	Tropical America	S	P	O	1974	I	+	
<i>Mimosa pigra</i> L.	Tropical America	S	P		2001	I	+	25
<i>Mimosa pudica</i> L.	Tropical America	S	P	O	1896	I	+	2
<i>Mucuna pruriens</i> (L.) DC. var. <i>utilis</i> (Wall. ex Wight.) Burck.	Tropics	H	A/P	F	1918	R	+	
<i>Neonotonia wightii</i> (Wight & Ann.) Lackey	Africa	H	P	F	1962	R	+	
<i>Pachyrrhizus erosus</i> (L.) Urb.	Tropical America	V	A/P	F	1896	R	+	2
<i>Psoralea corylifolia</i> L.	India, Malay, Indonesia	H	A	M	1984	R	+	26
<i>Senna hirsuta</i> (L.) Irwin & Barneby	America	H	A		1931	R	+	
<i>Senna occidentalis</i> (L.) Link	South America	H	P		1903	C	+	9
<i>Sesbania cannabina</i> (Retz.) Poir.	India	H	A	F	1914	I	+	
<i>Stylosanthes guianensis</i> (Aubl.) Sw.	Central and South America	H	P		1962	R	+	
<i>Tephrosia candida</i> (Roxb.) DC.	India	S	P	F	1928	R	+	
<i>Trifolium dubium</i> Sibth.	Europe	H	A	F	1980		+	

Species	Origin	LF	HA	U	Y	S	W	RE
<i>Trifolium pratense</i> L.	Europe	H		F	1931		+	
<i>Trifolium repens</i> L.	Europe	H	P	F	1916	I	+	
<i>Trigonella hamosa</i> Forssk.	Mideast	H			1999	R	+	27
<i>Vicia hirsuta</i> (L.) S. F. Gray	North Hemisphere	V	A		1901		+	9
<i>Vicia sativa</i> L. subsp. <i>nigra</i> (L.) Ehrh.	Europe	H	A		1906		+	9
<i>Vicia tetrasperma</i> (L.) Moench.	Europe	H	A/P		1904		+	9
<i>Vigna radiata</i> (L.) Wilczek	Thailand, Southeast Asia	H	A	F	1915	R	+	
<i>Vigna umbellata</i> (Thunb.) Ohwi & Ohashi	Subtropical Asia	V	A	M	1915	L	+	
Geraniaceae								
<i>Erodium cicutarium</i> (L.) L'Herit. ex Aiton	Europe and Africa	H	A/B		1994	R	+	28
<i>Erodium moschatum</i> (L.) L'Herit. ex Aiton	Europe and Africa	H	A		1992	R	+	29
<i>Geranium carolinianum</i> L.	North America	H	P		1977	L	+	13
Guttiferae								
<i>Hypericum monogynum</i> L.	China	S	P		1896	R		2
<i>Hypericum patulum</i> Thunb. ex Murray	China	S	P		1903	R	+	9
Haloragaceae								
<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	South America	H	P		1996	R	+	30
Labiatae								
<i>Ajuga decumbens</i> Thunb.	Japan, Korea and South China	H	P		1975	R	+	31
<i>Hyptis rhomboides</i> Mart & Gal.	Tropics	H	P		1896	R	+	2
<i>Perilla frutescens</i> (L.) Britt.	China	H	A		1896	R	+	2
<i>Salvia coccinea</i> Juss. ex Murray	Tropical America	H	P		1911	R	+	
Lythraceae								
<i>Ammannia coccinea</i> Rottb.	North America	H	A		1968		+	21
<i>Cuphea carthagenensis</i> (Jacq.) Macbrids	Tropical America	H	P		1960	I	+	
<i>Rotala ramosior</i> (L.) Koehne	North America	H	P		1942		+	
<i>Rotala rosea</i> (Poir) C. D. K. Cook	Asia	H	P		1896		+	21
Malvaceae								
<i>Abutilon crispum</i> (L.) Medicus	Tropical America	H	P		1992			
<i>Malachra capitata</i> (L.) L.	Tropical America	H			1987		+	32
<i>Malva neglecta</i> Wall L.	Warm regions of the old world	H	P	F	1973		+	
<i>Malva sinensis</i> Cav.	China	H	A/B	F	1898			9
<i>Malvastrum coromandelianum</i> (L.) Garcke	Tropical America	H	A		1896	C	+	2
<i>Malvastrum spicatum</i> (L.) A. Gray	Tropical America	H	A		1930			
Melastomataceae								
<i>Clidemia hirta</i> (L.) D. Don	Central and South America	S	P		1998	R	+	52
Molluginaceae								
<i>Mollugo verticillata</i> L.	Tropical America	H	A		1978		+	33
Nyctaginaceae								
<i>Boerhavia erecta</i> L.	Tropical America	H	A		2003		+	54
<i>Mirabilis jalapa</i> L.	Tropical America	H	P	O	1896	C	+	2
Onagraceae								
<i>Oenothera biennis</i> L.	North America	H	B		1986	I	+	
<i>Oenothera glazioviana</i> Micheli	Europe	H	B	F	1987	I	+	
<i>Oenothera laciniata</i> J. Hill	North America	H	P		1985	I	+	
<i>Oenothera stricta</i> Ledeb. ex Link	South America	H	A/B			C	+	
<i>Oenothera tetraptera</i> Cav.	Mexico and North America	H	A/P	F	1962	C	+	
Oxalidaceae								
<i>Oxalis corymbosa</i> DC.	South America	H	P	O	1928	I	+	
Papaveraceae								
<i>Argemone mexicana</i> L.	West Indies	H	A	O	1913	R	+	
<i>Papaver rhoeas</i> L.	Europe, Africa and Asia	H	A/B	O	1978	R	+	
Passifloraceae								
<i>Passiflora edulis</i> Sims.	Brazil	V	P	F	1916	I	+	15
<i>Passiflora foetida</i> L. var. <i>hispida</i> (DC. ex Triana & Planch.) Killip	South America	V	P	O	1938	I		
<i>Passiflora suberosa</i> L.	South America	H	P	O	1915	I	+	
Phytolaccaceae								
<i>Phytolacca americana</i> L.	North America	H	P	O	1962	C	+	34
Piperaceae								
<i>Peperomia pellucida</i> Kunth	North America	H	P		1928	R	+	

Species	Origin	LF	HA	U	Y	S	W	RE
Plantaginaceae								
<i>Plantago lanceolata</i> L.	Europe	H	P		1991	L	+	35
<i>Plantago virginica</i> L.	North America	H	A		1970		+	
Polygalaceae								
<i>Polygala paniculata</i> L.	Tropics	S	P		1926	R	+	
Polygonaceae								
<i>Antigonon leptopus</i> Hook. & Arn.	Mexico	V	P		1916			15
<i>Fagopyrum cymosum</i> (Trev.) Meisn.	China	H	P		1896		+	2
<i>Polygonum aviculare</i> L.	Europe	H	A		1983		+	
<i>Rumex acetosella</i> L.	Eurasia	H	P		1928		+	
<i>Rumex crispus</i> L.	Eurasia	H	P		1896		+	2
<i>Rumex maritimus</i> L.	Eurasia	H	A		1896		+	2
<i>Rumex obtusifolius</i> L.	Eurasia	H	P			L	+	
Portulacaceae								
<i>Portulaca pilosa</i> L. subsp. <i>grandiflora</i> (Hook.) Geesink	Tropical America	H	A		1916	C	+	15
<i>Talinum paniculatum</i> (Jacq.) Gaertn.	Tropical America	H	P	O	1898	C	+	9
Ranunculaceae								
<i>Semiaquilegia adoxoides</i> (DC.) Makino	China and Japan	H	P		2003			55
Rubiaceae								
<i>Diodia virginiana</i> L.	North America	H	P		1986		+	36
<i>Richardia brasiliensis</i> Gomez	South America	H	A		1987	R	+	32
<i>Richardia scabra</i> L.	Tropical America	H	A		1973	C	+	37
<i>Serissa serissoides</i> (DC.) Druce	China and Japan	H	P		1896			2
<i>Spermacoce articularis</i> L.	India	H	A		1908		+	37
<i>Spermacoce assurgens</i> Ruiz & Pavon	Tropical America	H	P		1984		+	37
<i>Spermacoce latifolia</i> Aublet	Tropical America	H	P		1942		+	8
Sapindaceae								
<i>Cardiospermum halicacabum</i> L.	Pan tropics	H	P		1896	I	+	2
Scrophulariaceae								
<i>Digitalis purpurea</i> L.	Europe	H	A/B	O	1911	L	+	
<i>Lindernia anagallidea</i> (Michaux) Pennell	North America	H	A		1988		+	38
<i>Lindernia dubia</i> (L.) Pennell	North America	H	A		1987		+	32
<i>Mecardonia procumbens</i> (Mill.) Small	Tropical America	H	P		1999		+	20
<i>Scoparia dulcis</i> L.	Tropical America	H	A		1896		+	2
<i>Veronica arvensis</i> L.	Europe	H	A		1992		+	39
<i>Veronica peregrina</i> L.	America, Siberia and Korea	H	A		1970		+	39
<i>Veronica persica</i> Poir.	Europe and West Asia	H	A/B		1911		+	39
Solanaceae								
<i>Brugmansia suaveolens</i> (Willd.) Bercht. & C. Presl	Brazil	S	P	O		C	+	
<i>Capsicum annuum</i> L.	Mexico and South America	H	A	F	1896		+	2
<i>Datura inoxia</i> Mill.	Mexico	H	A		1991		+	
<i>Datura metel</i> L.	America	H	A	O	1896	L	+	2
<i>Lycium chinense</i> Mill.	China, Japan, and Korea	S	P	M	1896		+	2
<i>Lycopersicon esculentum</i> var. <i>cerasiforme</i> (Dunal) A. Gary	Tropical America	H	A	O	1896		+	2
<i>Physalis angulata</i> L.	America	H	A		1896	C	+	2
<i>Physalis peruviana</i> L.	America	H	P		1975		+	
<i>Physalis pubescens</i> L.	America	H	A		1991		+	
<i>Solanum americanum</i> Miller	South America	H	A		1907	C	+	
<i>Solanum capsicoides</i> Allioni	Brazil	H	P		1899		+	9
<i>Solanum diphyllum</i> L.	Brazil	S	P	O	1928	C	+	14
<i>Solanum elaeagnifolium</i> Cav.	Tropical America	S	P		2001	R	+	40
<i>Solanum erianthum</i> D. Don		S	P	F	1896	R	+	2
<i>Solanum melongena</i> L.	South America	S	P		1896		+	2
<i>Solanum pseudocapsicum</i> L.	Madeira	S	P	O	1982		+	
<i>Solanum rostratum</i> Dunal	North America	H	A				+	
<i>Solanum seaforthianum</i> Ander.	Caribbean	V	P	O	1978		+	
<i>Solanum sisymbriifolium</i> Lam.	South America	H	A		1978		+	32
<i>Solanum torvum</i> Sw.	Caribbean	S	P		1896		+	2
Tiliaceae								

Species	Origin	LF	HA	U	Y	S	W	RE
<i>Corchorus olitorius</i> L.	Old world tropics	H	A		1896	C	+	2
<i>Muntingia calabura</i> L.	Tropical America	T	P		1936	C	+	
Umbelliferae								
<i>Apium leptophyllum</i> (Pers.) F. Muell.	Eurasia	H	P		1918		+	
<i>Eryngium foetidum</i> L.	Tropical America	H	A		1926		+	
Urticaceae								
<i>Pilea microphylla</i> (L.) Liebm.	South America	H	A		1912	C	+	
Verbenaceae								
<i>Clerodendrum chinense</i> (Osbeck) Mabberley	South Asia	S	P		1896	C	+	2
<i>Duranta repens</i> L.	Tropical America and Mexico	S	P	O	1896	C	+	2
<i>Lantana camara</i> L.	West Indies	S	P	O	1903	I	+	9
<i>Stachytarpheta cayennensis</i> (L. C. Rich) Vahl.	Tropical America	H	A	O		L	+	
<i>Stachytarpheta jamaicensis</i> (L.) Vahl.	Tropical America	S	P	O	1928	I	+	14
<i>Verbena bonariensis</i> L.	South America	H	P		1984		+	41
<i>Verbena brasiliensis</i> Vell.	South America	H	A		1991		+	5
Violaceae								
<i>Viola arvensis</i> Murray	Europe	H	A		1976		+	42
Zygophyllaceae								
<i>Tribulus cistoides</i> L.	Madagascar	H	P		1933		+	51
Monocotyledons								
Agavaceae								
<i>Agave gigantean</i> L.	Mexico	H	P	O	1910		+	
<i>Agave fourcroydes</i> Lem.	Tropical America	S	P		1910		+	
<i>Agave sisalana</i> Perr.	Mexico	H	P	O	1890	L	+	
Araceae								
<i>Amorphophallus campanulatus</i> (Roxb.) (<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson)	Madagascar	H	P		1914		+	19
<i>Colocasia esculenta</i> (L.) Schott var. <i>esculenta</i>	South China and India	H	P	F				
<i>Colocasia esculenta</i> (L.) Schott var. <i>antiquorum</i>	Tropical Asia	H	P	F				
<i>Colocasia gigantean</i> (Blume) Hook.	China, Laos and Vietnam	H	P				+	
<i>Colocasia tonoi</i> Nakai	China	H	P					
<i>Typhonium roxburghii</i> Schott	South Asia	H	P		1994			43
<i>Xanthosoma sagittifolium</i> (L.) Schott	South America	H	P				+	
<i>Xanthosoma violaceum</i> Schott	Tropical America	H	P				+	
Cannaceae								
<i>Canna indica</i> L.	Tropical America	H	P	O	1896	C	+	2
Cyperaceae								
<i>Cyperus alternifolius</i> L. subsp. <i>Flabelliformis</i> (Rottb.) Kük.	Madagascar	H	P	O	1929	C		
Poaceae (Gramineae)								
<i>Alopecurus myosuroides</i> Huds.	Europe	H	A		1897		+	44
<i>Anthoxanthum odoratum</i> L.	Europe and Siberia	H	P		1999		+	45
<i>Arrhenatherum elatius</i> (L.) J. Presl & C. Presl f.	Japan	H	P		1970		+	
<i>Avena fatua</i> L.	Europe	H	A		1961		+	
<i>Axonopus affinia</i> Chase	Tropical America	H	P	O	1953		+	
<i>Axonopus compressus</i> (Sw.) P. Beauv.	Tropical America	H	P	O	1960		+	46
<i>Brachiaria mutica</i> (Forsk.) Stapf	Tropical Africa	H	P		1960	I	+	44
<i>Briza minor</i> L.	Mediterranean	H	P	O	1937		+	
<i>Bromus catharticus</i> Vahl.	South America	H	A/B		1969	C	+	
<i>Bromus rigidus</i> Roth	Europe	H	A/B		1978			33
<i>Cenchrus echinatus</i> L.	Tropical America	H	A		1934		+	
<i>Chloris barbata</i> Sw.	Tropical America	H	A		1896	I	+	2
<i>Chloris gayana</i> Kunth.	Africa	H	A/P		1936		+	
<i>Chloris virgata</i> Sw.	North America	H	A		1958		+	
<i>Dactylis glomerata</i> L.	Europe	H	P		1957		+	44
<i>Dichanthium annulatum</i> (Forsk.) Stapf.	India	H	P		1969		+	44
<i>Dichanthium aristatum</i> (Poir.) C. E. Hubb.	India	H	P		1960		+	44
<i>Digitaria sanguinalis</i> (L.) Scop.	Europe	H	A		1954	C	+	44
<i>Eragrostis ciliaris</i> (L.) R. Br.	Paleotropics	H	A		1970		+	47
<i>Euchlaena mexicana</i> Schradl.	Mexico	H	A		1904			44
<i>Festuca arundinacea</i> Schreb.	Eurasia	H	P		1977		+	33

Species	Origin	LF	HA	U	Y	S	W	RE
<i>Holcus lanatus</i> L.	Eurasia	H	P		2000		+	48
<i>Lolium multiflorum</i> Michx.	Europe and Africa	H	A/P		1956		+	44
<i>Lolium perenne</i> L.	Europe	H	A/P		1957		+	44
<i>Melinis minutiflora</i> Beauv.	Africa	H	P		1969			44
<i>Panicum dichotomiflorum</i> Michx.	America	H	A		1969		+	8
<i>Panicum maximum</i> Jacq.	Tropical Africa	H	P		1928	I	+	
<i>Paspalidium flavidum</i> (Retz.) A. Camus	Tropical Asia	H	P		1992		+	49
<i>Paspalum conjugatum</i> Bergins	America	H	P		1926	I	+	
<i>Paspalum dilatatum</i> Poir.	South America	H	P		1958	C	+	
<i>Paspalum fimbriatum</i> Kunth	South America	H	A		1971		+	
<i>Paspalum paniculatum</i> L.	South America and west Africa	H	P		1999		+	45
<i>Paspalum urvillei</i> Steud.	Tropical America	H	P		1963	I	+	46
<i>Paspalum virgatum</i> L.	Jamaica	H	P		1972		+	8
<i>Pennisetum cladestinum</i> Hochst. ex Chiov.	Tropical Africa	H	P	O	1963	C	+	
<i>Pennisetum polystachion</i> (L.) Schult.	Tropical America	H	P		1960	I	+	
<i>Pennisetum purpureum</i> Schumach.	Tropical Africa	H	P		1959	I	+	
<i>Phalaris arundinacea</i> L.	North Hemisphere	H	P		1970		+	
<i>Phalaris canariensis</i> L.	West Mediterranean	H	P		1984		+	48
<i>Rhynchelytrum repens</i> (Willd.) C. E. Hubb.	Africa	H	A		1962	I	+	46
<i>Setaria geniculata</i> (Lam.) Beauv.	North America	H	P		1929		+	
<i>Setaria glauca</i> (L.) P. Beauv.	Eurasia	H	A/P		1896		+	2
<i>Sorghum halepense</i> (L.) Pers.	Mediterranean	H	P		1968		+	
<i>Vetiveria zizanioides</i> (L.) Nash	India, Europe and old world	H	P		1937		+	
<i>Vulpia myuros</i> (L.) Gmel.	Europe to West Asia	H	A		1969		+	
<i>Zoysia japonica</i> Steud.	China and Japan	H	P		1928		+	14
Iridaceae								
<i>Sisyrinchium atlanticum</i> Bickn.	North America	H	P	O	1930		+	
<i>Sisyrinchium iridifolium</i> Kunth	Tropical America	H	P	O	1910			
Pontederizaceae								
<i>Eichhornia crassipes</i> (Mart.) Solms	South America	H	P	O	1906	I	+	9
Taccaceae								
<i>Tacca leontopetaloides</i> (L.) Kuntze	Paleotropics	H	P		1904		+	9
Zingiberaceae								
<i>Alpinia galanga</i> (L.) Sw.	South Asia	H	P	M	1896			2
<i>Curcuma domestica</i> Valet	India	H	P	M	1896		+	2
<i>Hedychium coronarium</i> Koenig	Himalaya	H	P	O	1910	I	+	19
<i>Zigiber officinale</i> Roscoe	Tropical Asia	H	P	F	1896		+	2

LF: life form. H: herb; L: liana; V: vine; S: shrub; T: tree.

HA: habit. A: annual; B: biennial; P: perennial; A/B: annual or biennial; A/P: annual or perennial.

U: usage. O: ornamental; F: forage; M: medicinal.

Y: year of the first record.

S: status of naturalization. C: common; I: invasive; L: locally common; R: rare.

W: species listed in *Global Compendium of Weeds* (Randall, 2002).

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Table 2. List of possibly naturalized species.

Species	Origin	LF	HA	U	W
Dicotyledons					
Cucurbitaceae					
<i>Sicyos angulatus</i> L.	Tropical America	V	A		+
Euphorbiaceae					
<i>Phyllanthus amarus</i> Schum. & Thonn.	Florida, Mexico, Tropical America	H	A		+
<i>Phyllanthus debilis</i> Klein ex Willd.	South India to Java	H	A		+
<i>Phyllanthus cochinchinensis</i> Spreng. (<i>Phyllanthus embergeri</i> Haic. & Rossign.)	Assam to South China	H	A		+
<i>Phyllanthus urinaria</i> L. var. <i>hookeri</i> (Muell. Arg.) Hook. f. (<i>Phyllanthus hookeri</i> Muell. Arg.)	Tropical and subtropical Asia	H	A		
<i>Phyllanthus urinaria</i> L. subsp. <i>nudicarpus</i> Rossign. & Haic.	South China to Hainan	H	A		
<i>Phyllanthus ussuriensis</i> Rupr. & Maxim.	Mongolia to Japan	H	A		
Fabaceae					
<i>Arachis hypogea</i> L.	Brazil	H	A	F	+
<i>Bauhinia purpurea</i> L.	Southeast Asia	T	P	O	+
<i>Bauhinia variegata</i> L.	East Asia, India and China	T	P	O	+
<i>Crotalaria spectabilis</i> Roth.	India	H	A		+
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	Madagascar	T	P	O	+
<i>Haematoxylum campechianum</i> L.	Central America, West Indies	T	P	O	+
<i>Neptunia gracilis</i> Benth.	Australia	H	P	F	+
<i>Senna x floribunda</i> (Car.) Irwin & Barneby	Tropical America	T	P		+
<i>Senna siamea</i> (Lam.) Irwin & Barneby	India, Sri Lanka and Malaysia.	T	P	F	+
<i>Senna sulfurea</i> (Collad.) Irwin & Barneby	India, Sri Lanka and Australia	T	P	F	+
<i>Tephrosia noctiflora</i> Bojer ex Baker	Madagascar	S	P		+
Fumariaceae					
<i>Fumaria officinalis</i> L.	Europe	H	A		+
Polygonaceae					
<i>Rumex crispus</i> L. var. <i>japonicus</i> (Hout.) Makino	Native?	H	P		+
Monocotyledons					
Agavaceae					
<i>Yucca aloifolia</i> L.	North America	S	P	O	+
Poaceae					
<i>Phyllostachys pubescens</i> Mazel ex Houz.	China	H	P	O	
<i>Sorghum bicolor</i> (L.) Moench	Africa, Asia (introduced > 2,500 B. C.)	H	A	F	+
<i>Setaria italica</i> (L.) P. Beauv.	Eurasia	H	P		+
<i>Zea mays</i> L.	Americas	H	A	F	+

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W: species listed in *Global Compendium of Weeds* (Randall, 2002).

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台灣歸化植物名錄彙整：植物入侵研究之基礎

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摘 要

入侵植物所衍生的問題，近幾十年來已成為全世界廣泛關切與探討的課題，然而台灣地區的狀況近日始為各界所關注。有鑑於歸化 (naturalization) 是植物入侵 (plant invasion) 初始過程中不可或缺的環節，本研究在基本資料非常缺乏的情況下，於 2000 至 2003 年間，蒐集所有台灣地區歸化植物的相關文獻，並參訪各主要之標本館 (TAI, HAST, TAIF 以及 NCKU)，取得野外之採集紀錄，加以彙整成名錄，並附註各種之原生地 (origin)、生活型 (life form)、習性 (habit)、用途 (usage)、第一次採集年份 (year)、以及目前之野外狀況 (status) 等資料，以供日後相關研究參考之用。彙整結果台灣地區之歸化植物共有 60 科 222 屬 341 種，約等於台灣維管束植物種數的 7.9%。另有 25 種因資料不全，暫時列為可能之歸化物種。在台灣的歸化物種中，約有 90.9% 的歸化植物在國外通常被視為雜草 (weeds)，幾乎有一半 (48.3%) 是來自美洲地區。

關鍵詞：歸化植物、入侵植物、名錄、台灣。

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