

## Naturalized alien flora of the world: species diversity, taxonomic and phylogenetic patterns, geographic distribution and global hotspots of plant invasion

Naturalizovaná nepůvodní flóra světa: druhová diverzita, taxonomické a fylogenetické složení, geografické zákonitosti a globální ohniska rostlinných invazí

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Using the recently built Global Naturalized Alien Flora (GloNAF) database, containing data on the distribution of naturalized alien plants in 482 mainland and 362 island regions of the world, we describe patterns in diversity and geographic distribution of naturalized and invasive plant species, taxonomic, phylogenetic and life-history structure of the global naturalized flora as well

as levels of naturalization and their determinants. The mainland regions with the highest numbers of naturalized aliens are some Australian states (with New South Wales being the richest on this continent) and several North American regions (of which California with 1753 naturalized plant species represents the world's richest region in terms of naturalized alien vascular plants). England, Japan, New Zealand and the Hawaiian archipelago harbour most naturalized plants among islands or island groups. These regions also form the main hotspots of the regional levels of naturalization, measured as the percentage of naturalized aliens in the total flora of the region. Such hotspots of relative naturalized species richness appear on both the western and eastern coasts of North America, in north-western Europe, South Africa, south-eastern Australia, New Zealand, and India. High levels of island invasions by naturalized plants are concentrated in the Pacific, but also occur on individual islands across all oceans. The numbers of naturalized species are closely correlated with those of native species, with a stronger correlation and steeper increase for islands than mainland regions, indicating a greater vulnerability of islands to invasion by species that become successfully naturalized. South Africa, India, California, Cuba, Florida, Queensland and Japan have the highest numbers of invasive species. Regions in temperate and tropical zonobiomes harbour in total 9036 and 6774 naturalized species, respectively, followed by 3280 species naturalized in the Mediterranean zonobiome, 3057 in the subtropical zonobiome and 321 in the Arctic. The New World is richer in naturalized alien plants, with 9905 species compared to 7923 recorded in the Old World. While isolation is the key factor driving the level of naturalization on islands, zonobiomes differing in climatic regimes, and socioeconomy represented by per capita GDP, are central for mainland regions. The 11 most widely distributed species each occur in regions covering about one third of the globe or more in terms of the number of regions where they are naturalized and at least 35% of the Earth's land surface in terms of those regions' areas, with the most widely distributed species *Sonchus oleraceus* occurring in 48% of the regions that cover 42% of the world area. Other widely distributed species are *Ricinus communis*, *Oxalis corniculata*, *Portulaca oleracea*, *Eleusine indica*, *Chenopodium album*, *Capsella bursa-pastoris*, *Stellaria media*, *Bidens pilosa*, *Datura stramonium* and *Echinochloa crus-galli*. Using the occurrence as invasive rather than only naturalized yields a different ranking, with *Lantana camara* (120 regions out of 349 for which data on invasive status are known), *Calotropis procera* (118), *Eichhornia crassipes* (113), *Sonchus oleraceus* (108) and *Leucaena leucocephala* (103) on top. As to the life-history spectra, islands harbour more naturalized woody species (34.4%) than mainland regions (29.5%), and fewer annual herbs (18.7% compared to 22.3%). Ranking families by their absolute numbers of naturalized species reveals that *Compositae* (1343 species), *Poaceae* (1267) and *Leguminosae* (1189) contribute most to the global naturalized alien flora. Some families are disproportionally represented by naturalized aliens on islands (*Arecaceae*, *Araceae*, *Acanthaceae*, *Amaryllidaceae*, *Asparagaceae*, *Convolvulaceae*, *Rubiaceae*, *Malvaceae*), and much fewer so on mainland (e.g. *Brassicaceae*, *Caryophyllaceae*, *Boraginaceae*). Relating the numbers of naturalized species in a family to its total global richness shows that some of the large species-rich families are over-represented among naturalized aliens (e.g. *Poaceae*, *Leguminosae*, *Rosaceae*, *Amaranthaceae*, *Pinaceae*), some under-represented (e.g. *Euphorbiaceae*, *Rubiaceae*), whereas the one richest in naturalized species, *Compositae*, reaches a value expected from its global species richness. Significant phylogenetic signal indicates that families with an increased potential of their species to naturalize are not distributed randomly on the evolutionary tree. *Solanum* (112 species), *Euphorbia* (108) and *Carex* (106) are the genera richest in terms of naturalized species; over-represented on islands are *Cotoneaster*, *Juncus*, *Eucalyptus*, *Salix*, *Hypericum*, *Geranium* and *Persicaria*, while those relatively richer in naturalized species on the mainland are *Atriplex*, *Opuntia*, *Oenothera*, *Artemisia*, *Vicia*, *Galium* and *Rosa*. The data presented in this paper also point to where information is lacking and set priorities for future data collection. The GloNAF database has potential for designing concerted action to fill such data gaps, and provide a basis for allocating resources most efficiently towards better understanding and management of plant invasions worldwide.

**Key words:** alien species, distribution, Global Naturalized Alien Flora (GloNAF) database, invasive species, islands, life history, mainland, naturalized species, phylogeny, plant invasion, regional floras, species richness, taxonomy, zonobiome

## Introduction

Much of the current theory of biological invasions is based on macroecological analyses of regional floras (Cadotte et al. 2006, Richardson & Pyšek 2006, Pyšek & Richardson 2007, Fridley 2008). However, until recently the availability of such data on vascular plants remained geographically restricted, in sharp contrast to other taxonomic groups where global distribution data are available and have been analysed, such as birds (Blackburn & Duncan 2001, Blackburn et al. 2008, 2009, Dyer et al. 2017), mammals (Long 2003), reptiles (Krauss 2009, 2015), molluscs (Capinha et al. 2015) and bryophytes (Essl et al. 2015). This lack of vascular plant data has been particularly limiting because research using global datasets can inform about the mechanisms of invasion. The ordering of species into different stages in the invasion process (Richardson et al. 2000, Pyšek et al. 2004, Blackburn et al. 2011), including their proportional success in passing particular stages (Williamson & Brown 1986, Williamson & Fitter 1996, Jeschke & Strayer 2005) can reveal species traits and factors that, depending on invasion context, separate successful invaders from those that fail (Williamson 2006, Fridley 2008, Pyšek et al. 2009a, b, 2015, Richardson & Pyšek 2012). Solid information on alien species distributions over the globe is hence a key requirement for robust exploration of many research questions in invasion ecology, for better understanding of invasion mechanisms, and eventually for informing decision making.

The last decade has thus seen rapid development of numerous alien species databases, ranging in extent from regional to continental, built with the aim of collecting information on alien species status, distribution, pathways, impacts and other characteristics (Hulme & Weser 2011). One such effort was the European DAISIE project, which at the time was exceptional in terms of covering all major taxa and biomes for a whole continent and because the data were purposely collected based on standardized criteria (DAISIE 2009, Hulme et al. 2010, Pyšek et al. 2011). The product of this initiative, the DAISIE database and associated gateway ([www.europe-aliens.org](http://www.europe-aliens.org)), became a standard data source for alien plant species in Europe that allowed addressing new research questions (e.g. Winter et al. 2009, Pyšek et al. 2010, Essl et al. 2011, Feng et al. 2016), informed European policy on invasive alien species (Hulme et al. 2009, Kettunen et al. 2009), and stimulated more practical work on national inventories and assessment of invasion impacts (e.g. Brundu & Richardson 2016, Hoffmann & Broadhurst 2016, Pergl et al. 2016a, b). Based on the DAISIE database, Lambdon et al. (2008) provided a comprehensive analysis of the species composition and structure of regional floras in Europe, but such a detailed account has until now remained available only for this continent. Another major European alien species inventory compiled over the last decades is the North European and Baltic Network on Invasive Alien Species (NOBANIS; [www.nobanis.org](http://www.nobanis.org)), a joint effort of 18 European countries (Hulme & Weser 2011). For other continents, a comprehensive database, primarily focused on native taxa but also including the distribution of a complete alien flora, is the regularly updated BONAP database (Kartesz & Meacham 1999, Kartesz 2015), which has been used in a number of intercontinental analyses of plant invasions (Winter et al. 2010, Dawson et al. 2013, Kalusová et al. 2013, Pyšek et al. 2015, van Kleunen et al. 2015). However, BONAP has not yet been used for a thorough taxonomic description of the patterns in the alien flora of North America.

Besides those rather rare continental data collections, comprehensive information on complete alien floras is usually restricted to the regional or country level (e.g. South Africa: Henderson 2011, Chile: Fuentes et al. 2013), relates to a specific life history such as woody species (Richardson & Rejmánek 2004, Rejmánek & Richardson 2013, Oswalt et al. 2015), or otherwise specific circumstances such as invasive species in natural habitats (Weber 2003).

One effort towards obtaining a global coverage of plant invasions needs to be acknowledged, i.e. the compilation of the “Global Compendium of Weeds” (Randall 2002, 2012). This resource has been used to provide estimates of the global success of individual alien species in studies relating invasiveness to species traits and other factors (Pyšek et al. 2009a, Dawson et al. 2011, Dostál et al. 2013). As a valuable compilation of a large quantity of species lists from all over the world, it is nevertheless constrained by limitations such as overlapping and unclear criteria for species’ inclusion and status and should therefore be used as a rather general indicator of invasiveness for addressing larger-scale questions, as pointed out by Dawson et al. (2013). These authors concluded that existing distribution data should be integrated in a more sophisticated manner than simply compiling lists, e.g. by using common units of distribution in order to capture how widespread alien plant species are and to allow comparisons among species. Such an exhaustive synthesis of existing regional distributions should provide a more accurate index of the global invasiveness of species (Dawson et al. 2013).

Since the origin of invasion ecology as a distinct research field, understanding the macroecological and biogeographic patterns in the distribution of alien plants has been one of the foremost challenges. Studies based on species numbers from multiple regions (e.g. Rejmánek & Randall 1994, Rejmánek 1996, Vitousek et al. 1997, Sax 2001) provided important insights into how widespread a phenomenon invasions are and raised awareness of the problem within the scientific community and among relevant authorities. For obvious reasons, however, analyses based purely on species numbers are necessarily limited in that they cannot address the taxonomic and phylogenetic context, or track species exchange among regions. It is thus analyses based on the detailed knowledge of species composition that bring potentially novel insights (e.g. Winter et al. 2009, 2010, van Kleunen et al. 2015). The lack of comprehensive data on alien plant species from across the globe has hampered progress in understanding the patterns and processes that govern invasions, and in the development of adequate management responses. Surprisingly, despite the obvious need for a comprehensive global database on alien plants, no such database existed until recently.

The present paper is based on the recently built Global Naturalized Alien Flora (GloNAF; <https://glonaf.org>) database that has up to now been used to explore the global flows of alien species and their accumulation across continents (van Kleunen et al. 2015). In addition, it has been used to test some of the central hypotheses in invasion biology by relating naturalized species distributions to species traits (Dellinger et al. 2016, Razanajatovo et al. 2016), and to model the risks of future invasions (Klonner et al. 2017). Among the main findings so far are that climate change will increase the naturalization risk from alien garden plants in Europe (Dullinger et al. 2017), and that emerging economies in megadiverse countries are regions most vulnerable to future plant invasions because of the interaction of global trade and climate change (Seebens et al. 2015). GloNAF has also been used to demonstrate that niche dynamics of alien species do not



differ between sexual and apomictic flowering plants (Dellinger et al. 2016). Razanajatovo et al. (2016) used GloNAF and found that selfing ability drives global naturalization of alien plants directly as well as indirectly owing to correlations with monocarpy and a large native range size, which both promote naturalization success.

Here, we use GloNAF to summarize (i) patterns in diversity and geographic distribution of naturalized and invasive plant species, (ii) relationships between the numbers of naturalized, invasive and native species, and (iii) levels of naturalization on mainland and island regions. We provide a different angle compared with previous analyses (van Kleunen et al. 2015) by focusing on factors that interact in determining which regions are highly or little invaded. With this background, we present the main topics of this paper, which are to (iv) describe the taxonomic, phylogenetic and life-history structure of the global naturalized flora, and (v) provide information on the distribution of the globally most widespread naturalized species, genera and families.

## Methods

### *Compilation of data on naturalized alien floras: GloNAF database*

The present paper provides information on numbers of naturalized, invasive and native species in particular regions of the world (Appendix 1). The source for the numbers of naturalized species is the GloNAF database version 1.1 (van Kleunen et al. 2015), which was compiled between 2011–2015 by the GloNAF core team (WD, FE, HK, JP, PP, MvK, PW and MW) with contribution from the other authors of the present paper. GloNAF 1.1 contains inventories of naturalized alien plant species, including infraspecific and hybrid taxa, for 844 non-overlapping regions around the globe (see van Kleunen et al. 2015 for details on database compilation and Electronic Appendix 1 for complete list of data sources).

Only naturalized alien taxa are considered in the GloNAF database, defined as those that maintain self-sustaining populations independently of direct human intervention. The criteria for that definition follow Richardson et al. (2000, 2011), Pyšek et al. (2004) and Blackburn et al. (2011) and were applied as rigorously as data allowed. Taxa only known from cultivation and casuals (i.e. taxa found in the wild but not naturalized) were excluded whenever such information was provided. However, as some of the data sources did not provide clear definitions, it cannot be excluded that some of the alien species in some regions are not fully naturalized. For European countries whose floras distinguish two groups based on residence times, archaeophytes (alien species that arrived before the year 1492) and neophytes (species that arrived after the year 1492; Pyšek et al. 2004), only the latter were considered, because the archaeophyte status of some species is unclear, the classification is not available for all European regions, and it is not used in other regions of the world. Note, however, that a species can be an archaeophyte in one European country but a neophyte in another.

To standardize scientific names, each naturalized plant inventory was compared to The Plant List (2015), the most comprehensive working list of all plant species (Kalwij 2012). The taxonomic standardization was done using the R (R Core Team 2014) package Taxonstand (Cayuela & Oksanen 2014). In the analyses, we used the species names accepted by The Plant List, version 1.1 (as of 30 September 2013). Species not found in

The Plant List, even after accounting for spelling differences, were kept in the database using the names as used in the source data. In total, GloNAF 1.1 includes 13,168 taxa of which 13,033 are recognized by The Plant List (12,498 as accepted and 535 as unresolved names). The remaining 135 taxa do not occur in The Plant List, and among those 11 are ornamental cultivars (van Kleunen et al. 2015).

#### *Invasive species numbers*

To classify the species as invasive or not, we followed the definition used in environmental policy according to which invasive species exert negative impacts on the environment (CBD 2000, IUCN 2000). This definition differs somewhat from the one widely used in ecology that considers invasive species as the subset of naturalized alien species which spread rapidly from the point of introduction regardless of their impact (Richardson et al. 2000, 2011, Blackburn et al. 2011). The reason for this choice was partly pragmatic as some major databases listing invasive species follow the impact-based definition; using them made it possible to acquire data on the numbers of species that are categorized according to impact in a largely standardized manner and based on comparable criteria. Therefore, to avoid the influence of different interpretations of the term ‘invasive’ and to ensure a comprehensive and geographically balanced sampling, we based our consensus list of invasive alien plant species on three global data sources which provide standardized information on regions where alien plants are reported as invasive: (i) the CABI Invasive Species Compendium (<http://www.cabi.org/isc>), which contains 672 plant data sheets with information on invasiveness in national and subnational regions, (ii) the ISSG Global Invasive Species Database (<http://www.iucngisd.org/gisd>; Pagad et al. 2016), which contains information on invasiveness of 2530 plant species in countries and subnational administrative regions such as US states, and (iii) the database of 451 invasive plant species by Weber (2003, extended with unpublished data), which gives their distributions in 32 regions of the world. Alien plant species that were reported as invasive, corresponding to the above definition (CBD 2000, IUCN 2000) were extracted from these data sources, and their scientific names were standardized as above. Finally, total numbers of invasive alien plants were calculated per GloNAF region. This approach yielded data on invasive alien plant species distributions in 349 non-overlapping regions of the world.

#### *Native species numbers*

For each GloNAF region, we collected information on the number of native species in the flora, using a wide range of sources that are listed in Electronic Appendix 1. If archaeophytes were reported we excluded them from the lists of native species.

#### *Species attributes*

For each species in the GloNAF database, we extracted information on its native range. More specifically, we compiled data on which of the nine continents recognized by the Biodiversity Information Standards Organization (originally Taxonomic Databases Working Group) (TDWG continents; Brummit 2001) the species is native to, or whether the species is known only from cultivation or resulted from hybridization between two

alien species, or between an alien and a native species. Most of the native-range data were extracted from the World Checklist of Selected Plant Families (WCSP 2014) supplemented with data from the Germplasm Resources Information Network (GRIN 2014). For the ~4000 species in GloNAF that were not included in these two major data sources, we retrieved information on native ranges from additional searches (see van Kleunen et al. 2015 for details). Information on the native range was found for all but 98 species, thus was available for 13,070 species (99.2%).

To explore the global patterns with respect to different life histories or growth forms (annual grass, annual forb, perennial grass, perennial forb, shrub, tree, aquatic plant, climber), we matched the GloNAF taxa with trait information from three different databases: the World Checklist of Selected Plant Families (WCSP 2014), the BONAP database (Kartesz 2015), and the European Garden Flora (Cullen et al. 2011). For taxa still lacking data information was obtained from various internet sources. Life-history information was found for 13,055 taxa (i.e. 99.1% of the total species covered by GloNAF).

#### *Region environmental data*

Each of the 844 regions considered in the present study (Appendix 1) was assigned to one of the nine continents (level 1) of the TDWG scheme: Europe, Africa, temperate Asia, tropical Asia, Australasia, Pacific island region, North America, South America and Antarctica (Brummit 2001), and to one of the following zonobiomes: I. Tropical (equatorial); II. Tropical (savanna); III. Subtropical (arid); IV. Mediterranean; V. Warm temperate; VI. Temperate (nemoral); VII. Arid temperate (continental); VIII. Cold temperate (boreal); IX. Arctic (based on Walter & Breckle 1991; see Fig. 1 for the global distribution of zonobiomes). For regions spanning over more than one zonobiome, the one indicated as dominant, in terms of prevailing area, has been chosen to represent the region. However, in some cases the region was assigned to the zonobiome that was most relevant for invasion; for example most of the territory of Algeria falls within the dry subtropics, due to the Sahara desert, but most alien plants are recorded from the mediterranean part, hence it was classified within the mediterranean zonobiome. Islands close to the mainland were assigned to the same zonobiome as the adjacent mainland, and distant islands were evaluated individually based on climate diagrams.

Each region was further classified as an island or mainland, whether located in the Old World (Europe, Asia, Africa) or New World (Australia, North America, South America, Pacific Islands), and its altitudinal range was recorded. For islands, distance to the nearest continental landmass, excluding Antarctica, was obtained from Weigelt & Kreft (2013). The area of regions included in the GloNAF 1.1 database, considering only the ice-sheet free areas of each region, ranges from 0.03 to 2,486,952 km<sup>2</sup>, with a median of 20,918 km<sup>2</sup> (van Kleunen et al. 2015).

To evaluate the effect of socioeconomic variables that have been repeatedly shown to correlate with the levels of invasion (e.g. Pyšek et al. 2010, Essl et al. 2011, Seebens et al. 2015), we acquired data on per-capita gross domestic product (GDP; CIA 2013, Gennaioli et al. 2014, United Nations Statistics Division 2015).



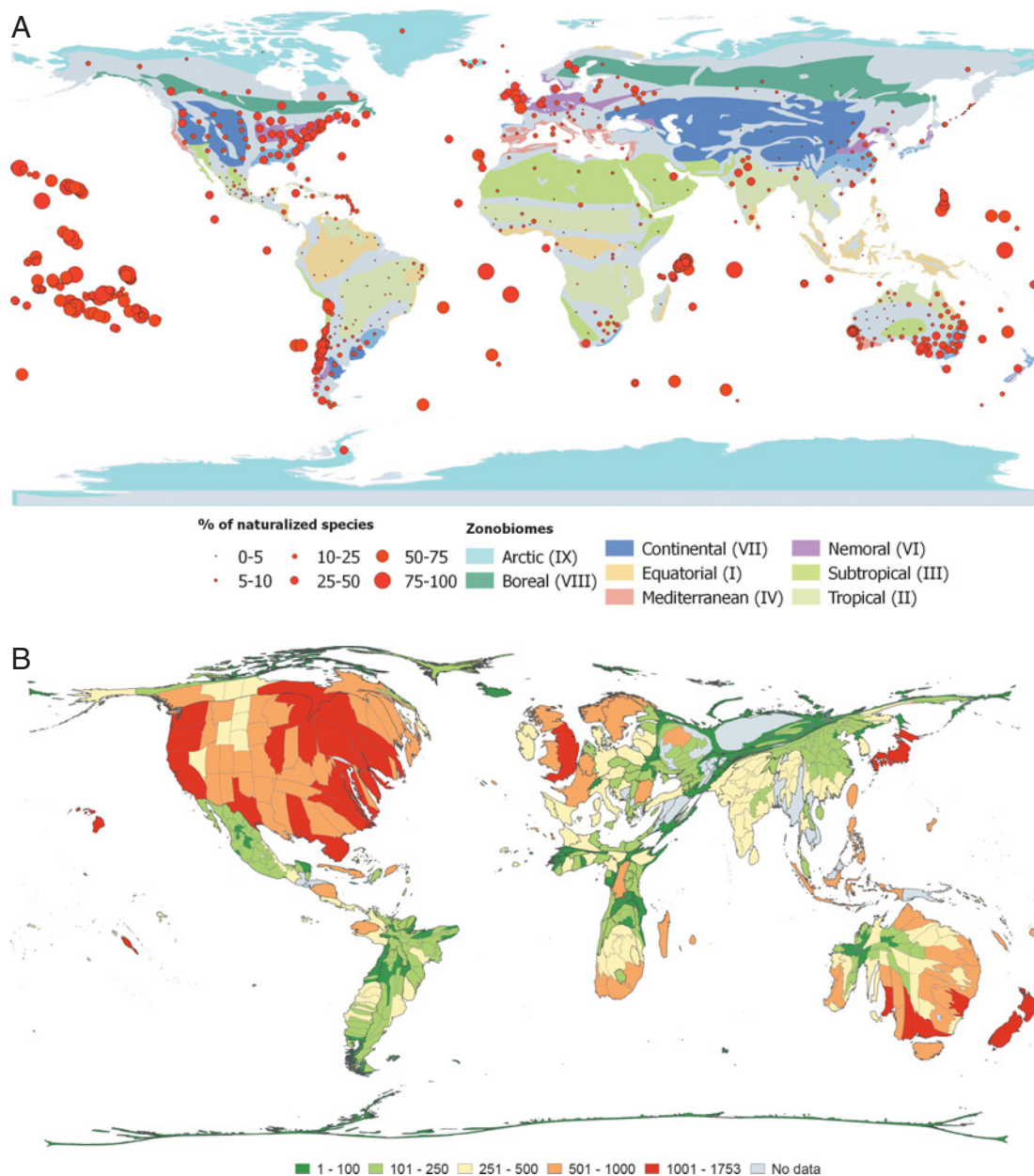


Fig. 1. – (A) Global map of the naturalization hotspots based on the percentage of naturalized species in regional floras covered by the GloNAF database shown by using red symbols. Distribution of the zonobiomes (based on Walter & Breckle 1991) is shown as a background (grey are the mountains and transitional zonobiomes). (B) Density equalizing cartogram created with the Cartogram Tool for ArcGIS using the algorithm developed by Gastner & Newman (2004). The shape of polygons is changed based on the absolute numbers of naturalized species in GloNAF regions. Size of the regions are modified to reflect how much the number of naturalized aliens deviates from expectations based on their areas, with those over-represented in aliens displayed larger and vice versa.

*Statistical analysis*

We tested for the effect of geographic and socioeconomic factors on the percentage of naturalized species in the total flora of individual regions ( $n = 844$ ) using regression trees and random forests (Breiman et al. 1984, De'ath & Fabricius 2000). Random forests rank the importance of variables in a regression or classification problem, based on generating a large number of trees (Breiman 2001). The region-specific variables included in the models were zonobiome, Northern/Southern Hemisphere, Old vs. New World, area (in  $\text{km}^2$ ; log-transformed), altitudinal range (in m), per capita GDP (in USD), and in case of islands also the distance to the nearest landmass (in km). We did not include primary climatic variables as the effect of climate was represented by zonobiomes.

Regression trees were constructed using binary recursive partitioning, with the default Gini index impurity measure used as the splitting index, in CART v. 7.0 (Breiman et al. 1984, Steinberg & Colla 1995). To find an optimal tree, a sequence of nested trees of decreasing size, each being the best of all trees of its size, was produced, and their resubstitution relative errors, corresponding to residual sums of squares, were estimated. Ten-fold cross-validation was used to obtain estimates of relative errors for these trees. Following De'ath & Fabricius (2000), the most likely (modal) single minimum cost tree was chosen for description from a series of 50 cross-validation runs.

Differences in the relationship between the numbers of native, naturalized and invasive species, and region area were tested by comparing slopes using ANCOVA and by deletion tests (Crawley 2007). To test whether the proportions within the categories of life history and origin were lower or higher than expected by chance, counts of species were compared with G-tests on contingency tables (e.g. Sokal & Rohlf 1995). To ascertain in which classes the counts appeared lower or higher than could be expected by chance, adjusted standardized residuals of G-tests were compared with critical values of the normal distribution following Řehák & Řeháková (1986).

To test whether the observed numbers of naturalized taxa per family were larger or smaller than expected, we compared the observed numbers with those based on random draws from the extant global flora. For the latter, we used a list of 337,130 plant taxa in which each of the 465 vascular plant families recognized by the Plant List was represented by the number of accepted taxa it has in the Plant List (version 1.1). We then randomly drew 12,498 taxa, which equals the number of taxa in GloNAF with accepted names in the Plant List, from the extant flora, and noted the number of taxa in each family. This was repeated 999 times. A family was considered to be significantly over-represented among the global naturalized flora if its observed number of naturalized taxa was within the top 2.5% quantile of the distribution of numbers for that family from the random draws. A family was considered as significantly under-represented if the observed number was within the lower 2.5% quantile of the distribution.

To test for a phylogenetic signal in the proportion of naturalized plant species per family (i.e. whether families with large proportions are evolutionary more closely related to each other), we first constructed a phylogenetic tree of all vascular plant families recognized by The Plant List (version 1.1; <http://www.theplantlist.org>). A topology of the phylogenetic tree of vascular plant families was built using Phylomatic version 3 (<http://phylodiversity.net/phyloomatic>; Webb & Donoghue 2005). Branch lengths were calibrated based on known node ages using the function BLADJ – Branch Length

ADJustment – in the program Phylocom version 4.1 (Webb et al. 2008; for more details on the construction of the tree, see Electronic Appendix 2). As our data were proportions, they are not normally distributed, and might not follow the Brownian motion evolutionary model, which is an assumption of many phylogenetic signal statistics such as Blomberg's K. While the test statistic itself would be non-informative for our data, the randomization procedure to test significance of Blomberg's K and thus whether there is a phylogenetic signal or not should be robust (Enrico Rezende, personal communication). This randomization test makes no assumption about the evolutionary model that produced the data observed at the tips of the phylogeny. To be able to incorporate error (i.e. variance) in the proportions of naturalized species per family (Ives et al. 2007), we used the *phylosig* function in the *phytools* package (Revell 2012) of R (version 3.1.2; R Core Team 2014). As there are many families with few taxa, we followed the recommendation to add two successes and two failures in the calculation of the proportion of naturalized species per family, and used an arcsin-square-root transformation (Liam J. Revell; <https://www.mail-archive.com/r-sig-phylo@r-project.org/msg02720.html>). The variance of the arcsin-square root transformed proportion was calculated as  $1/(4 \times \text{total number of species per family})$ , as per Warton & Hui (2011). The number of randomizations for the significance test was set to 10,000.

## Results

### *Global patterns of naturalized plant diversity and relationship with native richness*

GloNAF 1.1 covers over 83% of the world's ice-free terrestrial surface in terms of regions for which complete naturalized floras are available (as in van Kleunen et al. 2015; Fig. 1 and Appendix 1). This figure markedly differs among individual TDWG continents, with near-complete data coverage being available in GloNAF for Australasia (99.5% coverage), Africa (98.6%), North America (95.9%), South America (95.8%) and Antarctica (90.2%). Coverage is lower for tropical Asia (68.5%) and temperate Asia (54.8%), where data are missing mostly for parts of Russia. The lack of data on naturalized floras for some regions of the European part of Russia also results in rather low coverage for Europe as a whole (63.8% of the continent area). Data on the composition of naturalized alien floras are available for about half of the total area of Pacific islands (49.1%).

The mainland regions with the highest numbers of naturalized aliens are some Australian states (with New South Wales being the richest in species) and several North American regions (of which California with 1753 naturalized plant species is the world's richest region; see van Kleunen et al. 2015). England, Japan, New Zealand and the Hawaiian archipelago are the islands or island groups with the greatest richness of naturalized plants (Appendix 1). Such ranking, however, only partly allows for comparison among regions because it does not take into account their widely differing areas – the number of naturalized species significantly increases with increasing area for mainland (slope  $b = 0.45$ ) and even steeper so for island regions ( $b = 0.66$ ; Fig. 2). At the continental level, North America and Australasia in particular harbour greater richness of naturalized plants than expected from their area (Fig. 1B).

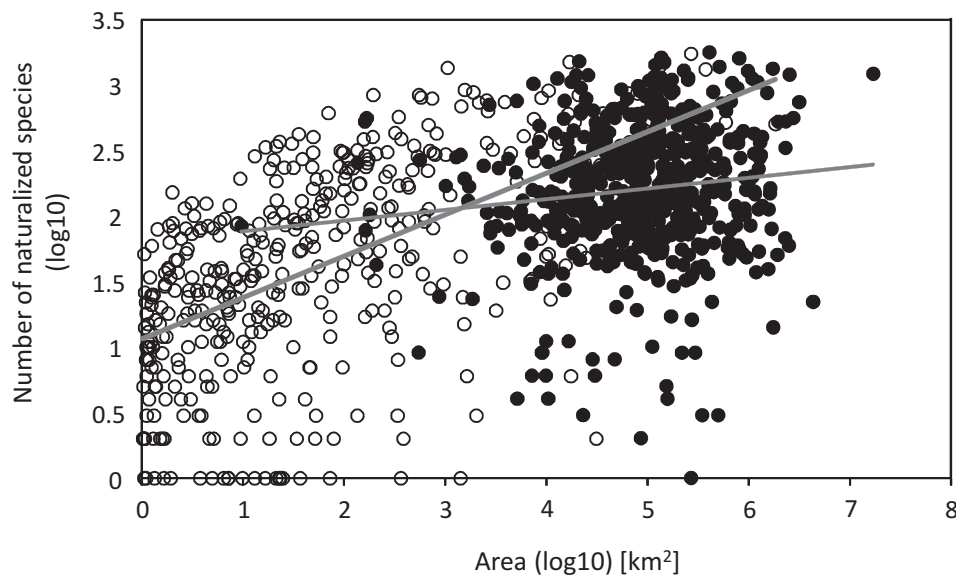


Fig. 2. – Species-area relationships of naturalized plant species for island (open circles,  $n = 362$ ) and mainland regions (filled circles,  $n = 482$ ). See Table 1 for the list of regions and data on naturalized species richness. The slope for islands ( $b = 0.66$ , S.E. = 0.026,  $F_{1,360} = 656.8$ ,  $P < 0.001$ ) is significantly (ANCOVA,  $F_{1,839} = 38.98$ ,  $P < 0.001$ ) steeper than for mainland ( $b = 0.45$ , S.E. = 0.005,  $F_{1,480} = 7866$ ,  $P < 0.001$ ). Overall variation explained by the ANCOVA is  $R^2 = 0.646$  for islands, and  $R^2 = 0.943$  for mainland regions.

Nevertheless, the majority of the above-mentioned regions also form the main hotspots of naturalization, measured as the percentage of naturalized alien species in the total flora of the region (and therefore accounting for the differing areas of the regions). Such hotspots of relative naturalized species richness appear on both the western and eastern coasts of North America, in north-western Europe, South Africa, the south-eastern part of Australia, New Zealand, and several Indian states; very high levels of island invasions by naturalized plants are concentrated in the Pacific, but also occur on individual islands across all oceans (Fig. 1A, Appendix 1). Still, when interpreting the hotspot patterns in Fig. 1, it needs to be noted that the high levels of regional naturalizations are inferred from the species richness of entire floras and mapped as such for the whole countries or regions, not necessarily implying that they are valid for their whole territories. The resulting picture is therefore coarser than can be achieved by relating levels of invasion to the regional distribution of habitats (e.g. Chytrý et al. 2009a, b, 2012).

The data show a higher vulnerability of islands to plant invasions. While for mainland regions the distribution is strongly skewed, with 56% of all regions' percentages of naturalized aliens not exceeding 10% and only 2% with over 40% naturalized aliens, for islands the distribution is more even across frequency classes; for 41% of the island regions, naturalized alien plants account for more than 40% of their floras. Moreover, the patterns are strikingly different among particular continents: some follow the strongly skewed global pattern (Europe, Asia, South America), while the two continental regions with the highest levels of naturalization (North America, Australasia) show a more even pattern, which is to some extent also true for Africa (Fig. 3).

The numbers of naturalized and native species in regions are significantly positively related to each other, with much stronger correlation for islands than for mainland regions ( $R^2 = 0.50$  vs  $0.23$ , respectively). Furthermore, the number of naturalized species on islands increases significantly faster with increasing native species richness than for mainland regions (Fig. 4). In mainland regions, there is a rather steep increase in the number of naturalized species with the number of native species for regions harbouring up to ~1000 native species; after this threshold the regions that are richer in native species can harbour both very high and very low numbers of naturalized aliens (Fig. 4A). The increase on islands is steadier across the whole range of native species richness values (Fig. 4B).

#### *Patterns in invasive species*

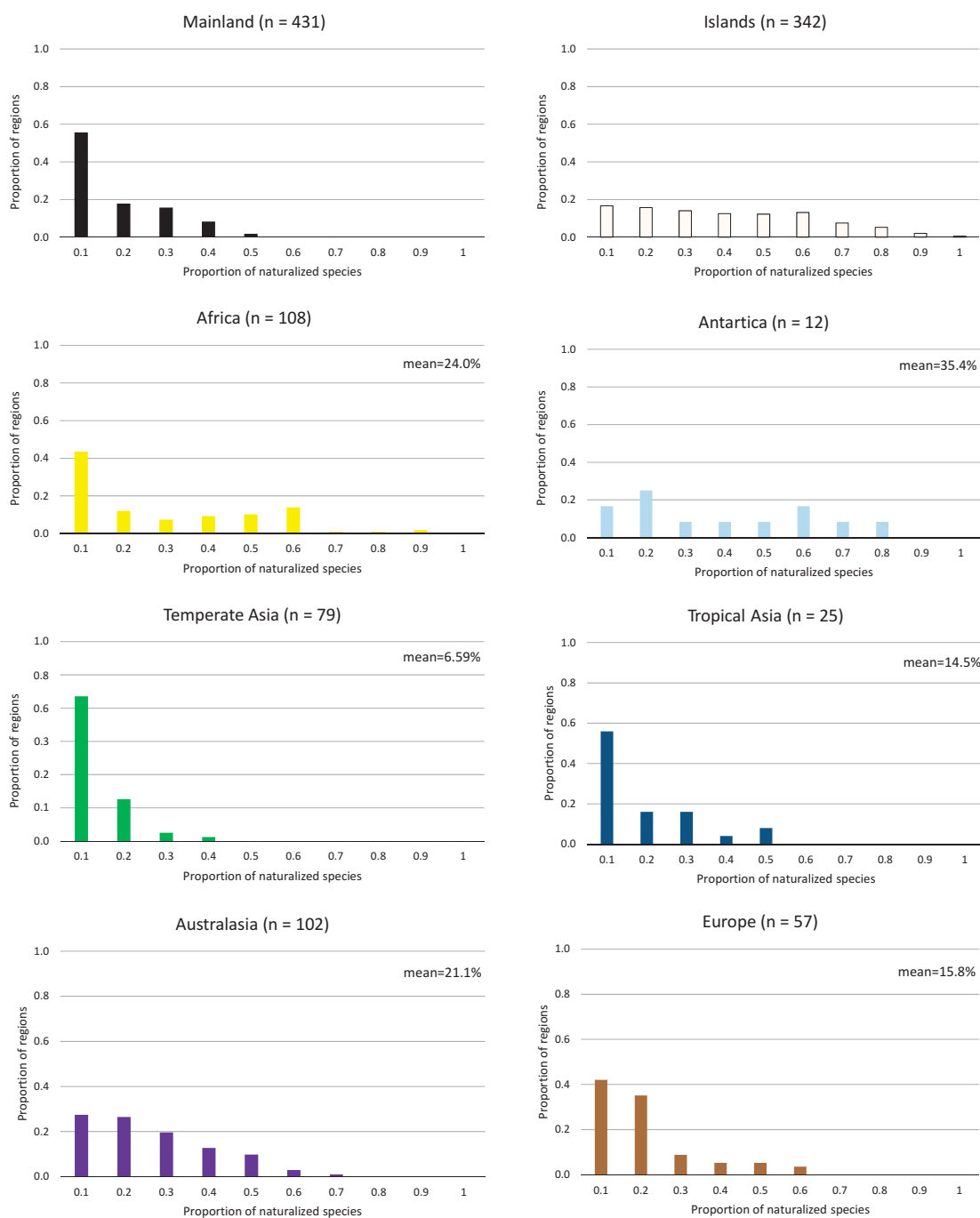
South Africa, India, California, Cuba, Florida, Queensland and Japan are regions with the highest numbers of reported invasive species. As there is a strong correlation ( $R^2 = 0.44$  and  $0.45$ , respectively, Fig. 4C, D) between the numbers of invasive and all naturalized species (the latter group includes the former species as a subset), the patterns in invasive species hotspots correspond to those described above for the naturalized species. The increase in the number of invasive species with that of naturalized species is significantly faster for mainland than island regions; interestingly, in mainland regions, it corresponds more closely to the rate of increase predicted by the Tens Rule (Williamson & Fitter 1996; Fig. 4C). Appendix 1 gives the number of invasive species per region where this information is available ( $n = 349$  non-overlapping regions).

#### *Geographical structure of naturalized species richness: continents, zonobiomes and insularity*

North America (5958 taxa), Europe (4139), and Australasia (3886) are richest in absolute total naturalized species numbers as recorded on TDWG continents (reported in van Kleunen et al. 2015). All other continents, except Antarctica, harbour naturalized species numbers ranging between ~2000–3500 (Table 1).

Among the zonobiomes, areas in the temperate nemoral zone are richest in naturalized species (6586), followed by tropical (equatorial and savanna), and warm temperate zonobiomes, with > 4600 species each (Table 1). Together all temperate zonobiomes harbour 9036 naturalized species compared to 6774 for tropical ones, followed by 3280 species naturalized in the mediterranean zonobiomes, 3057 in subtropical zonobiomes and 321 in the Arctic. If the total numbers of naturalized species are related to the area covered by each zonobiome, by comparing the rate of species accumulation with area, a general trend appears to be that the accumulation is rather fast in colder temperate and mediterranean regions and slow in arid zonobiomes (Table 2).

In summary, GloNAF 1.1 records a total of 12,345 naturalized alien taxa in mainland regions, and 8019 in island regions. The New World is richer in naturalized alien plants, with 9905 taxa compared to 7923 recorded in the Old World, which covers a larger area in our data set (61,490,000 km<sup>2</sup> vs 46,960,000 km<sup>2</sup> for the New World). The difference is marginally significant if the rate of naturalized species accumulation with area is used as a measure (slope  $z$  of the species-area relationship for the New World =  $0.23 \pm 0.01$ , for the Old World =  $0.19 \pm 0.02$ ;  $F = 3.06$ ;  $df = 1, 839$ ;  $P = 0.08$ ).





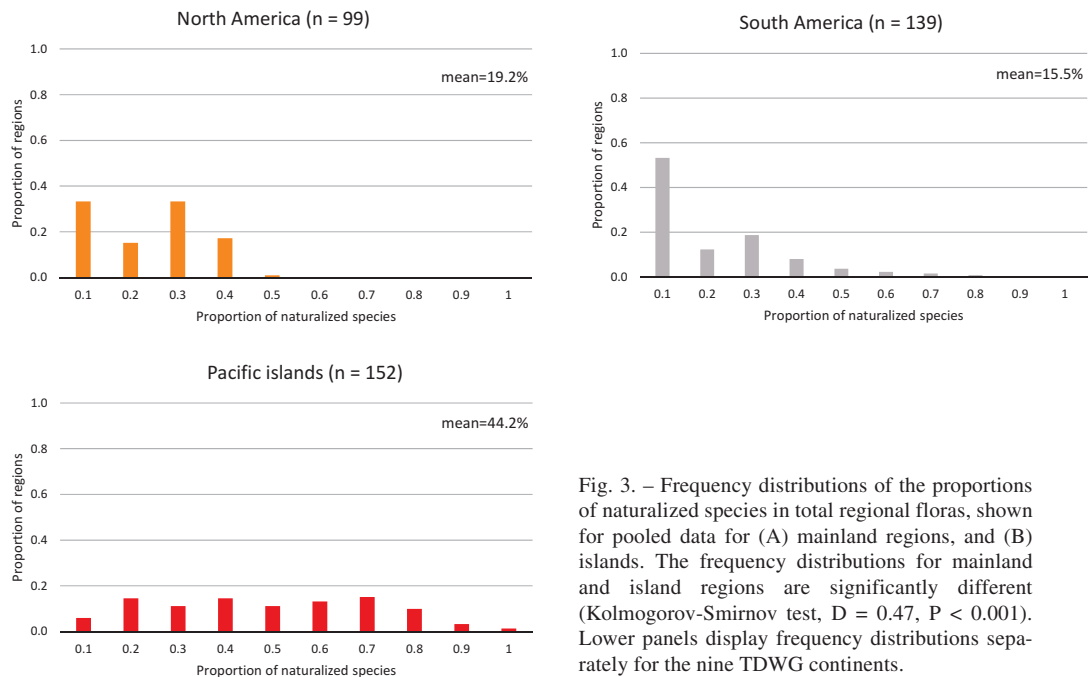
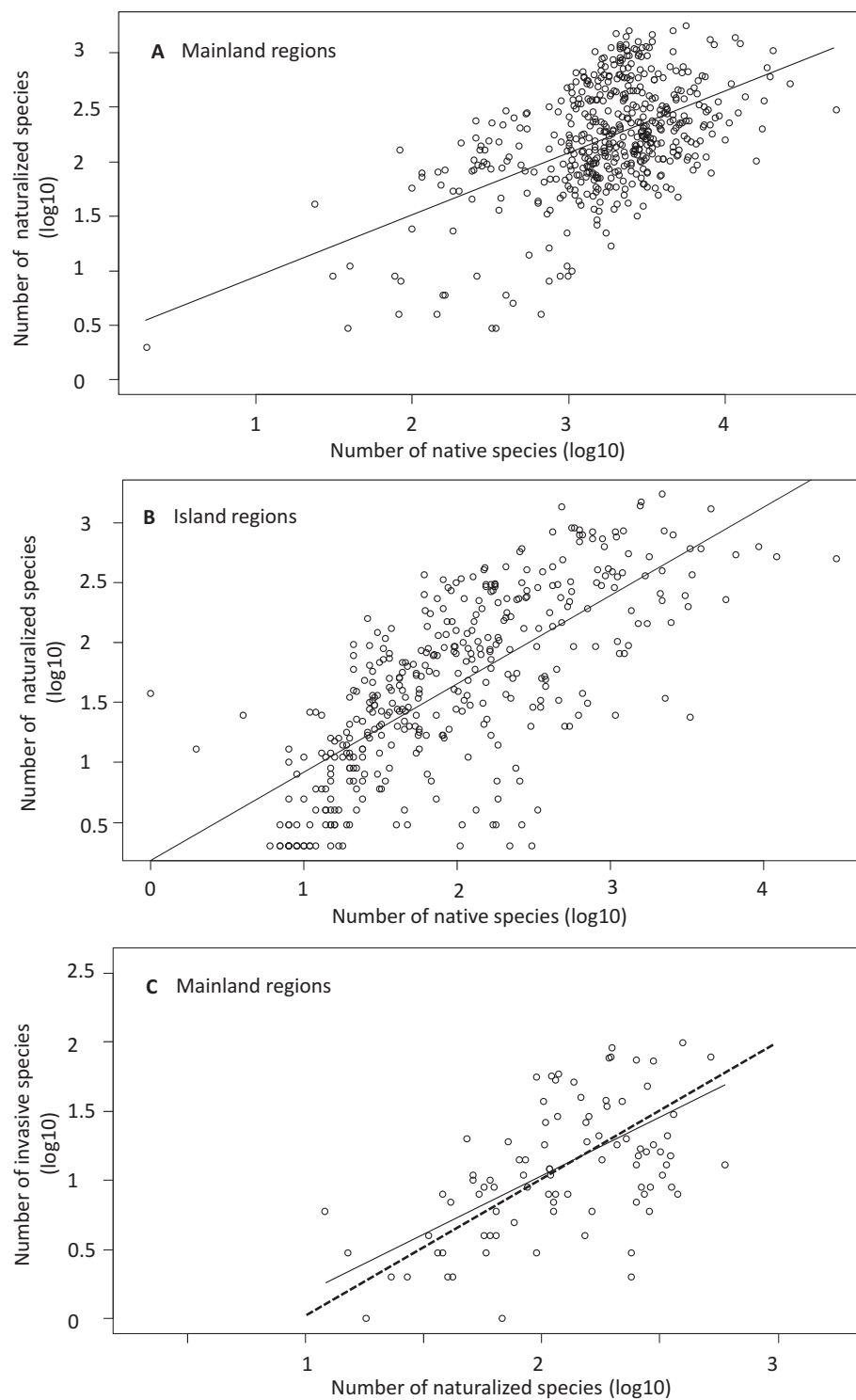


Fig. 3. – Frequency distributions of the proportions of naturalized species in total regional floras, shown for pooled data for (A) mainland regions, and (B) islands. The frequency distributions for mainland and island regions are significantly different (Kolmogorov-Smirnov test,  $D = 0.47$ ,  $P < 0.001$ ). Lower panels display frequency distributions separately for the nine TDWG continents.

#### *Factors determining the levels of naturalization in floras of the world*

The factors determining the percentage of naturalized species in floras as revealed by regression-tree analyses markedly differ between mainland and island regions. The best regression tree for the mainland regions (Fig. 5A) had six nodes ( $R^2 = 0.51$ ). For mainland regions, the main split was among zonobiomes, with regions located mainly in colder temperate and mediterranean climates harbouring on average twice as many naturalized aliens (19%) as those located in arid temperate, subtropical and tropical climates (10%). The level of naturalization in the former group of zonobiomes, colder temperate and mediterranean, was further differentiated by whether the region is located in the Old World, where the values are on average 10%, or in the New World, where the average level of naturalization was as high as 25%. Finally, the patterns are fine-tuned by per-capita GDP. Regions in arid temperate, subtropical and tropical climates with a higher per-capita GDP, the threshold being ~17,000 USD per capita, harbour on average more than twice the percentage of naturalized alien plants in their floras (16%) than regions below this GDP value (6%). Interestingly, 33 regions in our dataset with per capita GDP >54,000 USD exhibited rather low levels of naturalization (represented by a number of Australian regions, Liechtenstein and Luxembourg in Europe, Campeche in Mexico, and Washington D.C. in the USA), and appear in both parts of the regression tree separated by zonobiomes. This seems to suggest that there is an optimum range of GDP



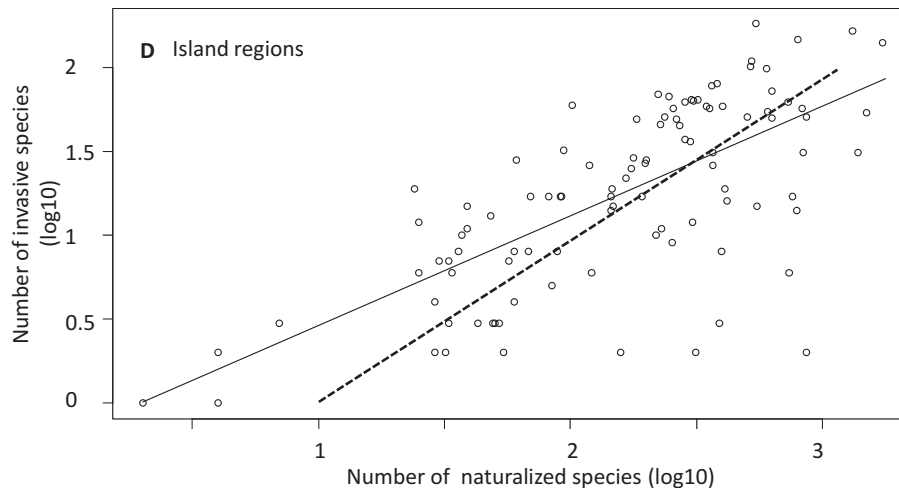


Fig. 4. – Relationships between the numbers of naturalized and native species shown for (A) mainland regions, and (B) island regions, and the relationship between invasive and naturalized alien species in (C) mainland and (D) island regions. The number of naturalized species on islands increased with the number of native species at a higher rate than in mainland regions ( $P < 0.001$ ,  $t = 3.75$ ; differences in slopes tested by analysis of covariance on  $\log_{10}+1$  transformed species numbers), but the increase in the number of invasive species with that of naturalized species was significantly faster for mainland than for island regions ( $P < 0.05$ ,  $t = 2.5$ ). All slopes were significantly different from zero: (A)  $\text{Naturalized} = 0.60 + 0.51 \cdot \log_{10}(\text{Native})$ ;  $R^2 = 0.23$ ,  $F = 141.8$ ,  $df = 1, 429$ ,  $P < 0.001$ ; (B)  $\text{Naturalized} = 0.18 + 0.73 \cdot \log_{10}(\text{Native})$ ;  $R^2 = 0.50$ ,  $F = 346.2$ ,  $df = 1, 340$ ,  $P < 0.001$ ; (C)  $\text{Invasive} = -0.65 + 0.83 \cdot \log_{10}(\text{Naturalized})$ ;  $R^2 = 0.45$ ,  $F = 217.5$ ,  $df = 1, 263$ ,  $P < 0.001$ ; (D)  $\text{Invasive} = -0.12 + 0.61 \cdot \log_{10}(\text{Naturalized})$ ;  $R^2 = 0.44$ ,  $F = 63.9$ ,  $df = 1, 81$ ,  $P < 0.001$ . The dashed line indicates the rate of increase in invasive species with that of naturalized as predicted by the Tens Rule (Williamson & Fitter 1996). The 95% confidence interval for the slope of the relationship for mainland regions is  $0.72 - 0.94$ , and for islands  $0.46 - 0.76$ , both are significantly different from the Tens Rule prediction at  $P < 0.05$  and  $P < 0.01$ , respectively. Note the log scale.

where the levels of naturalization are the highest (27% of naturalized alien plants in floras of temperate and mediterranean climates of the New World, and 18% in the other zonobiomes) (Fig. 5A).

Besides zonobiome, per-capita GDP and location in the Old or New World, there were several other variables that did not appear in the regression tree but contributed to the structuring of the level of invasion in mainland regions. The ranking of variables according to their relative importance using random forests ( $R^2 = 0.59$ ; with per-capita GDP set to 100%) revealed that besides zonobiome (83.7%) and whether the region is in the Old or New World (26.4%) also log area (48.0%), hemisphere (16.6%), mean altitude (13.6%) and altitudinal range (6.6%) appeared among the significant explanatory factors.

The best regression tree for islands ( $R^2 = 0.33$ ) had six nodes. Remote islands, separated by more than 1230 km from the nearest continental landmass, are markedly more invaded than those located closer to the mainland (on average 43% vs 24% of the floras consist of naturalized aliens, respectively). The level of naturalization on these more isolated islands is further enhanced if their altitude is  $> 7$  m a.s.l., and a very high average level of naturalization (55%) is found for 54 islands that are more than  $\sim 4100$  km away from the mainland; those among them that are  $> 2$  km<sup>2</sup> harbour the highest percentage of naturalized aliens in their flora of the whole data set (61%). Floras of less remote islands

Table 1. – Total numbers of naturalized alien taxa recorded in mainland and island regions, in particular TDWG continents, and in zoniomes of the globe (based on Walter & Breckle 1991). Note that only Pacific islands are classified as a separate TDWG continent, islands in other oceans are assigned to the nearest continents. Numbers for TDWG continents are taken from van Kleunen et al. (2015).

| Insularity  | Mainland<br>12,345          | Island<br>8019            |                            |                    |                      |                            |                                         |                                     |            |
|-------------|-----------------------------|---------------------------|----------------------------|--------------------|----------------------|----------------------------|-----------------------------------------|-------------------------------------|------------|
| Continent   | Europe                      | Africa                    | Asia<br>(temperate)        | Asia<br>(tropical) | Australasia          | Pacific                    | North<br>America                        | South<br>America                    | Antarctica |
| Species no. | 4139                        | 3563                      | 2416                       | 2138               | 3886                 | 2935                       | 5958                                    | 3117                                | 159        |
| Zonobiomes  | I. Tropical<br>(equatorial) | II. Tropical<br>(savanna) | III. Subtropical<br>(arid) | IV. Mediterranean  | V. Warm<br>temperate | VI. Temperate<br>(nemoral) | VII. Arid<br>temperate<br>(continental) | VIII. Cold<br>temperate<br>(boreal) | IX. Arctic |
| Species no. | 4690                        | 4843                      | 3057                       | 3280               | 4649                 | 6586                       | 1425                                    | 2739                                | 321        |

Table 2. – The rate of increase in numbers of naturalized taxa with area for zoniomes. Slopes  $z$  (from equation species no. =  $c \cdot \text{Area}^z$ ) are given with standard errors (S.E.) and results of multiple comparisons are shown for each slope; those bearing the same letters are not significantly different. Zoniomes are ranked according to the decreasing value of the slope.

| Zoniome                           | Slope | S.E.  | Multiple comparisons |
|-----------------------------------|-------|-------|----------------------|
| VIII. Cold temperate (boreal)     | 0.358 | 0.035 | a                    |
| VI. Temperate (nemoral)           | 0.269 | 0.066 | b                    |
| IV. Mediterranean                 | 0.243 | 0.043 | b                    |
| IX. Arctic                        | 0.212 | 0.104 | ab                   |
| I. Tropical (equatorial)          | 0.189 | 0.038 | b                    |
| II. Tropical (savanna)            | 0.186 | 0.043 | b                    |
| V. Warm temperate                 | 0.179 | 0.062 | b                    |
| VII. Arid temperate (continental) | 0.104 | 0.159 | abc                  |
| III. Subtropical (arid)           | 0.046 | 0.078 | c                    |

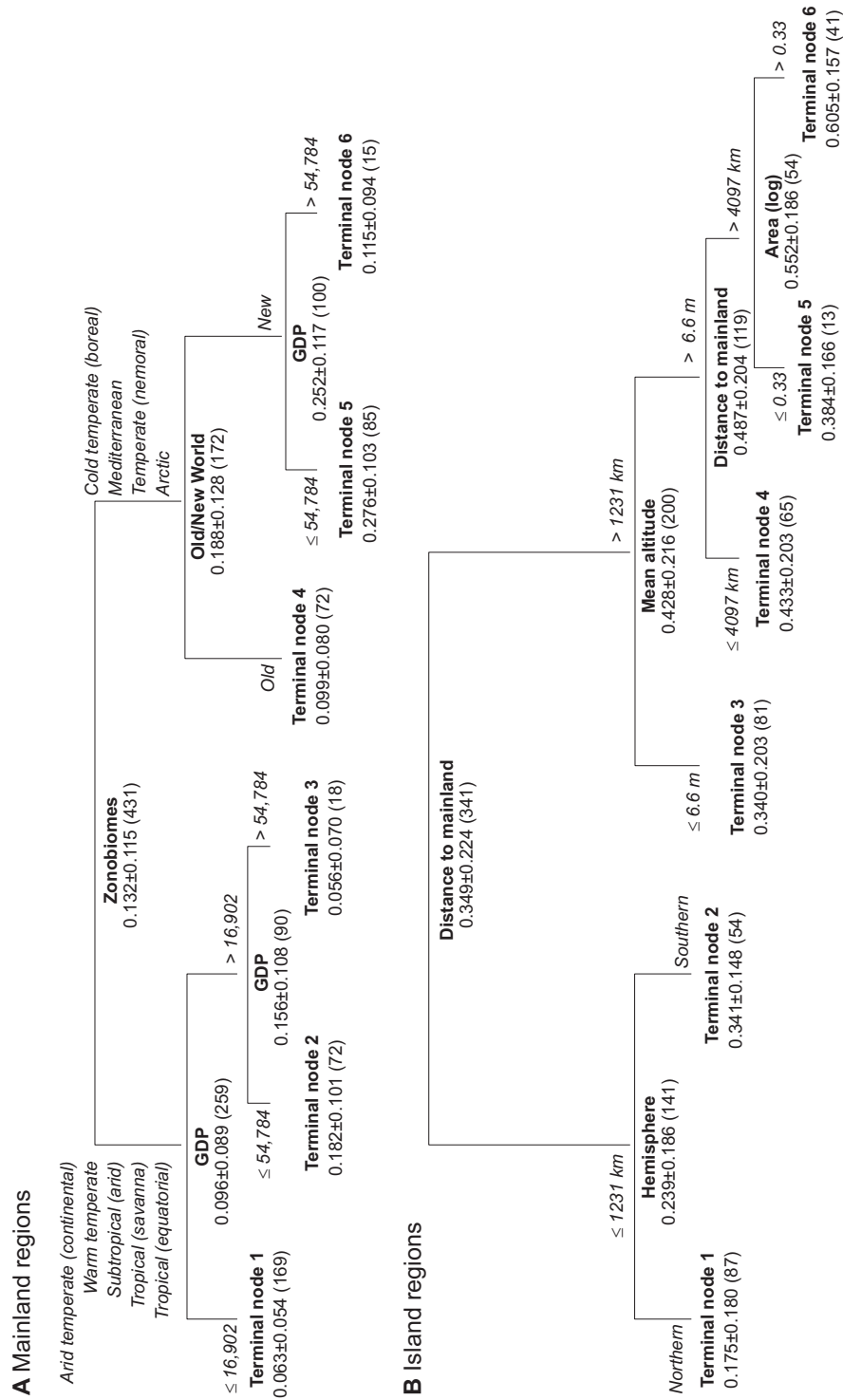


Fig. 5. – Best regression trees describing which factors determine the proportion of naturalized alien species in (A) mainland and (B) island regions (expressed as the percentage of the total flora). Each node of the tree is described by the splitting variable and its split value, mean  $\pm$  standard deviation of the percentage of naturalized species, and the number of regions in that node in brackets. The vertical depth of each node is proportional to its improvement value that corresponds to the explained variance at that node.

(< 1230 km from the nearest continental landmass) in the Southern Hemisphere (harbouring on average 34% of naturalized species) are more invaded than less remote islands in the Northern Hemisphere (18%), which are the least invaded in the whole data set (Fig. 5B).

The ranking of variables according to their importance as explanatory variables, using random forests ( $R^2 = 0.43$ ; with distance from mainland set to 100%) was zonobiome (31.8%), per-capita GDP (27.3%), log area (15.3%), middle altitude (13.6%), hemisphere (11.3%), Old vs New World (7.2%) and the range of altitudes (2.9%).

#### *Taxonomic composition of global naturalized alien flora*

Overall, the frequency distribution of the number of regions per species is strongly skewed, indicating that the vast majority of naturalized aliens have restricted distributions in terms of their naturalized ranges, and only a few are widely distributed across the globe (Fig. 6A). The two measures of naturalized species occurrences, the number of regions and their total area, are closely correlated (Fig. 6B).

The 200 most widely distributed (i.e. the top 1.5%) naturalized alien species are listed in Table 3, with their frequency of occurrence classified by continents, biomes and insularity. In terms of the latter factor, while the majority of these widespread naturalized aliens occur with similar frequency both in mainland and island regions, some exhibit a strong affinity to one of the region types. For example, among the 21 species that are recorded as naturalized in more than 40% of mainland regions, some have markedly restricted distributions on islands, with those from which they are known as naturalized not exceeding 10% of the total number of islands: *Polygonum aviculare* (present on 42.8% of mainland regions and on 7.5% of all islands sampled;  $n = 482$  and 362, respectively), *Digitaria sanguinalis* (43.9% vs 7.7%), *Sonchus asper* (45.3% vs 9.1%), *Lolium perenne* (40.7% vs 9.1%), *Echinochloa crus-galli* (49.3% vs 9.7%), *Sorghum halepense* (41.8% vs 9.7%), *Capsella bursa-pastoris* (54.1% vs 9.9%). In contrast, species with the strongest affinity for islands are *Phyllanthus amarus* (found on 35.1% of islands, but only on 7.1% of the mainland regions sampled), *Carica papaya* (33.4% vs 13.1%), *Cyanthillium cinereum* (31.5% vs 12.1%), *Euphorbia hirta* (39.2% vs 24.1%), *Catharanthus roseus* (33.1% vs 18.7%), *Mangifera indica* (24.9% vs 11.0%), *Bryophyllum pinnatum* (24.0% vs 11.6%), *Casuarina equisetifolia* (24.9% vs 12.5%), *Cenchrus echinatus* (26.5% vs 14.8%) and *Psidium guajava* (26.0% vs 14.8%).

The 11 most widely distributed species each occur on about one third of the globe or more in terms of the number of regions where they are naturalized and at least 35% of the Earth's land surface in terms of those regions' areas (Table 3). The most widely distributed species, *Sonchus oleraceus* occurs in 48% of the regions, which together cover 42% of the Earth's land surface. Other widely distributed species are *Ricinus communis*, *Oxalis corniculata*, *Portulaca oleracea*, *Eleusine indica*, *Chenopodium album*, *Capsella bursa-pastoris*, *Stellaria media*, *Bidens pilosa*, *Datura stramonium* and *Echinochloa crus-galli*. Interestingly, these 11 top species are representatives of nine families (with only *Compositae* and *Poaceae* listed more than once), and include annual and perennial herbs and grasses, as well as a shrub and a tree (Table 3).



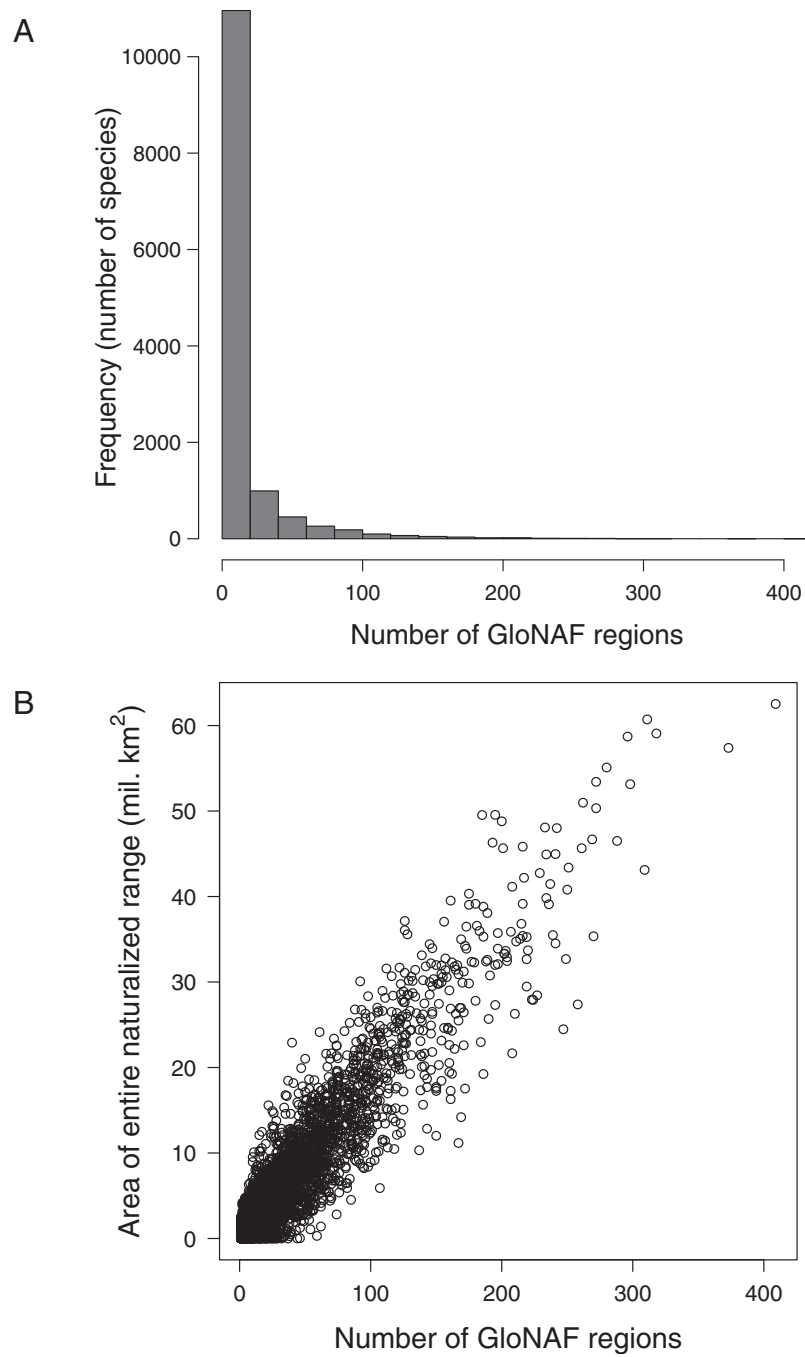


Fig. 6. – Range sizes of naturalized taxa on mainland regions. (A) Histogram of the number of GloNAF regions per taxon, and (B) the association between number of GloNAF regions and cumulative area of these regions per taxon (Spearman  $\rho = 0.770$ ,  $P < 0.001$ ).

Table 3. – Overview of the 200 most widely distributed naturalized plant taxa, as recorded in 844 global regions (Regs total). Species are ranked according to decreasing number of regions, and are all those that occur in at least 125 regions (14.8% of the total). For each species, the total area of the regions in which it is recorded, number of mainland (Main reg, n = 482) and island regions (Isl reg, n = 362), and numbers of regions on TDWG continents (Eur – Europe, n = 62; Afr – Africa, n = 136; As-tm – Asia temperate, n = 80; As-tr – Asia tropical, n = 44; Aus – Australasia, n = 102; Pac – Pacific Islands, n = 152; NAm – North America, n = 99; SAm – South America, n = 156; Ant – Antarctica, n = 12), and in the particular zoniomes, are also given. LH (life history): ag – annual grass, bg – biennial grass, ph – perennial herb, bh – biennial herb, ph – perennial herb, s – shrub, t – tree. Family names are abbreviated by the first four letters. Continents of native distribution are the same TDWG continents used to display naturalized distributions; cult – origin unknown or originated in cultivation. Author names are according to The Plant List (2015).

| Taxon                                        | Family | LH            | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |       |     |     |     |     | Number of regions by zoniomes |      |     |    |        |    |
|----------------------------------------------|--------|---------------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-------|-----|-----|-----|-----|-------------------------------|------|-----|----|--------|----|
|                                              |        |               |                                  |            |                               |          |         | Eur                                     | Afr | As-tm | As-tr | Aus | Pac | NAm | SAm | Ant                           | I-II | III | IV | V-VIII | IX |
| <i>Sonchus oleraceus</i> (L.) L.             | Comp   | ah            | Eur Afr As-tm As-tr              | 409        | 62 527 773                    | 298      | 111     | 4                                       | 42  | 29    | 38    | 89  | 41  | 94  | 68  | 4                             | 195  | 59  | 43 | 110    | 2  |
| <i>Ricinus communis</i> L.                   | Euph   | ah ph s t Afr | As-tr                            | 373        | 57 390 161                    | 259      | 114     | 13                                      | 81  | 38    | 39    | 48  | 45  | 59  | 50  | 0                             | 219  | 47  | 29 | 78     | 0  |
| <i>Oxalis corniculata</i> L.                 | Oxal   | ah ph         | cult                             | 318        | 59 078 687                    | 237      | 81      | 23                                      | 61  | 27    | 35    | 32  | 33  | 59  | 44  | 4                             | 167  | 17  | 13 | 120    | 1  |
| <i>Portulaca oleracea</i> L.                 | Port   | ah            | NAm Eur                          | 311        | 60 721 886                    | 215      | 96      | 15                                      | 56  | 37    | 37    | 20  | 66  | 61  | 19  | 0                             | 168  | 17  | 18 | 108    | 0  |
| <i>Eleusine indica</i> (L.) Gaertn.          | Poac   | ag pg         | Afr As-tm As-tr                  | 309        | 43 115 559                    | 197      | 112     | 19                                      | 9   | 21    | 4     | 38  | 73  | 75  | 69  | 1                             | 182  | 27  | 14 | 86     | 0  |
| <i>Chenopodium album</i> L.                  | Amar   | ah            | Eur Afr As-tm NAm                | 298        | 53 142 110                    | 260      | 38      | 11                                      | 28  | 52    | 14    | 49  | 3   | 85  | 55  | 1                             | 84   | 42  | 38 | 133    | 1  |
| <i>Capsella bursa-pastoris</i> (L.) Medik.   | Bras   | ah            | Eur Afr As-tm As-tr              | 296        | 58 712 668                    | 260      | 36      | 8                                       | 19  | 38    | 34    | 48  | 5   | 83  | 60  | 1                             | 103  | 38  | 20 | 130    | 5  |
| <i>Stellaria media</i> (L.) Vill.            | Cary   | ah ph         | Eur Afr As-tm As-tr              | 288        | 46 501 955                    | 233      | 55      | 4                                       | 26  | 39    | 15    | 49  | 10  | 83  | 58  | 4                             | 99   | 32  | 22 | 129    | 6  |
| <i>Bidens pilosa</i> L.                      | Comp   | ah            | NAm SAm                          | 280        | 55 094 275                    | 179      | 101     | 6                                       | 83  | 26    | 14    | 35  | 64  | 25  | 27  | 0                             | 186  | 26  | 9  | 59     | 0  |
| <i>Datura stramonium</i> L.                  | Sola   | ah            | NAm                              | 272        | 53 418 029                    | 218      | 54      | 32                                      | 39  | 41    | 13    | 37  | 6   | 56  | 48  | 0                             | 92   | 25  | 31 | 124    | 0  |
| <i>Echinochloa crus-galli</i> (L.) P. Beauv. | Poac   | ag            | Eur Afr As-tm As-tr              | 272        | 50 337 063                    | 237      | 35      | 13                                      | 6   | 45    | 33    | 48  | 8   | 86  | 33  | 0                             | 104  | 32  | 12 | 124    | 0  |
| <i>Amaranthus viridis</i> L.                 | Amar   | ah            | Pac                              | 270        | 35 350 032                    | 174      | 96      | 15                                      | 27  | 32    | 34    | 44  | 56  | 24  | 38  | 0                             | 167  | 23  | 22 | 58     | 0  |
| <i>Poa annua</i> L.                          | Poac   | ag bg         | Eur                              | 269        | 46 685 500                    | 219      | 50      | 4                                       | 26  | 33    | 14    | 47  | 9   | 90  | 37  | 9                             | 84   | 35  | 22 | 121    | 7  |
| <i>Brassica rapa</i> L.                      | Bras   | ah bh         | cult                             | 262        | 50 978 397                    | 204      | 58      | 17                                      | 19  | 38    | 1     | 31  | 26  | 65  | 64  | 1                             | 83   | 20  | 29 | 128    | 2  |
| <i>Plantago major</i> L.                     | Plan   | ph            | Eur                              | 261        | 45 650 472                    | 198      | 63      | 4                                       | 21  | 20    | 4     | 28  | 19  | 94  | 68  | 3                             | 114  | 26  | 15 | 104    | 2  |
| <i>Euphorbia hirta</i> L.                    | Euph   | ah            | NAm SAm                          | 258        | 27 378 484                    | 116      | 142     | 0                                       | 74  | 13    | 39    | 28  | 91  | 8   | 5   | 0                             | 220  | 17  | 4  | 17     | 0  |
| <i>Sonchus asper</i> (L.) Hill               | Comp   | ah            | Eur Afr As-tm As-tr              | 251        | 43 384 573                    | 218      | 33      | 5                                       | 22  | 20    | 34    | 31  | 3   | 84  | 51  | 1                             | 97   | 34  | 17 | 101    | 2  |
| <i>Mirabilis jalapa</i> L.                   | Nyct   | ph s          | SAm                              | 250        | 40 804 678                    | 166      | 84      | 9                                       | 46  | 35    | 35    | 20  | 42  | 30  | 33  | 0                             | 155  | 8   | 16 | 71     | 0  |

| Taxon                                    | Family | LH       | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |       |     |     |    |    |    |     | Number of regions by zoniomes |     |     |        |    |
|------------------------------------------|--------|----------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-------|-----|-----|----|----|----|-----|-------------------------------|-----|-----|--------|----|
|                                          |        |          |                                  |            |                               |          |         | Number of regions invaded on continents |     |       |       |     |     |    |    |    |     | Number of regions by zoniomes |     |     |        |    |
|                                          |        |          |                                  |            |                               |          |         | Eur                                     | Afr | As-tm | As-tr | Aus | Pac | NA | SA | Am | Ant | I-II                          | III | IV  | V-VIII | IX |
| <i>Chenopodium murale</i> L.             | Amar   | ah       | Eur Afr As-tm                    | 249        | 32 688 690                    | 187      | 62      | 5                                       | 25  | 2     | 7     | 68  | 13  | 73 | 55 | 1  | 94  | 58                            | 34  | 63  | 0      |    |
| <i>Cynodon dactylon</i> (L.) Pers.       | Poac   | bg pg    | Afr As-tm As-tr                  | 247        | 24 474 963                    | 154      | 93      | 11                                      | 4   | 0     | 3     | 39  | 62  | 75 | 52 | 1  | 134 | 42                            | 14  | 57  | 0      |    |
| <i>Medicago sativa</i> L.                | Legu   | ah ph    | Eur Afr As-tm<br>As-tr           | 242        | 48 004 914                    | 205      | 37      | 31                                      | 15  | 18    | 7     | 46  | 9   | 63 | 51 | 2  | 49  | 35                            | 37  | 119 | 2      |    |
| <i>Digitaria ciliaris</i> (Retz.) Koeler | Poac   | ag pg    | Afr As-tr NAM<br>SAM             | 241        | 34 514 805                    | 179      | 62      | 7                                       | 5   | 25    | 32    | 48  | 41  | 56 | 27 | 0  | 135 | 32                            | 11  | 63  | 0      |    |
| <i>Rumex crispus</i> L.                  | Poly   | ph       | Eur Afr As-tm                    | 241        | 44 966 947                    | 204      | 37      | 0                                       | 13  | 24    | 9     | 45  | 6   | 90 | 51 | 3  | 73  | 38                            | 19  | 109 | 2      |    |
| <i>Digitaria sanguinalis</i> (L.) Scop.  | Poac   | ag       | Eur Afr As-tm<br>As-tr           | 239        | 35 488 828                    | 211      | 28      | 12                                      | 16  | 17    | 33    | 38  | 1   | 83 | 38 | 1  | 93  | 36                            | 15  | 95  | 0      |    |
| <i>Plantago lanceolata</i> L.            | Plan   | ah bh ph | Eur Afr As-tm<br>As-tr           | 237        | 41 463 327                    | 192      | 45      | 2                                       | 18  | 19    | 5     | 37  | 15  | 77 | 61 | 3  | 72  | 34                            | 25  | 102 | 4      |    |
| <i>Sorghum halepense</i> (L.) Pers.      | Poac   | bg pg    | Afr As-tm As-tr                  | 236        | 39 098 637                    | 201      | 35      | 21                                      | 22  | 9     | 9     | 35  | 11  | 79 | 50 | 0  | 97  | 36                            | 23  | 80  | 0      |    |
| <i>Erigeron canadensis</i> L.            | Comp   | ah       | NAM SAM                          | 234        | 44 925 087                    | 193      | 41      | 47                                      | 21  | 52    | 9     | 26  | 8   | 63 | 8  | 0  | 65  | 5                             | 18  | 146 | 0      |    |
| <i>Solanum americanum</i> Mill.          | Sola   | ah ph s  | Eur Afr As-tm<br>As-tr NAM SAM   | 234        | 39 822 876                    | 158      | 76      | 6                                       | 58  | 12    | 38    | 73  | 19  | 24 | 2  | 2  | 134 | 32                            | 23  | 45  | 0      |    |
| <i>Polygonum aviculare</i> L.            | Poly   | ah ph    | Eur As-tm                        | 233        | 48 078 620                    | 206      | 27      | 2                                       | 13  | 34    | 2     | 44  | 2   | 68 | 67 | 1  | 52  | 33                            | 28  | 116 | 4      |    |
| <i>Lolium perenne</i> L.                 | Poac   | ag bg pg | Eur Afr As-tm<br>As-tr           | 229        | 42 746 870                    | 196      | 33      | 12                                      | 13  | 43    | 3     | 43  | 3   | 66 | 43 | 3  | 46  | 22                            | 20  | 137 | 4      |    |
| <i>Erigeron bonariensis</i> L.           | Comp   | ah       | SAM                              | 227        | 28 443 027                    | 160      | 67      | 16                                      | 38  | 26    | 12    | 60  | 31  | 20 | 23 | 1  | 102 | 33                            | 39  | 53  | 0      |    |
| <i>Echinochloa colona</i> (L.) Link      | Poac   | ag       | Afr As-tm As-tr                  | 224        | 27 915 059                    | 153      | 71      | 10                                      | 1   | 2     | 34    | 28  | 41  | 58 | 50 | 0  | 142 | 32                            | 17  | 33  | 0      |    |
| <i>Euphorbia prostrata</i> Aiton         | Euph   | ah       | NAM SAM                          | 223        | 27 938 785                    | 107      | 116     | 11                                      | 61  | 10    | 28    | 17  | 73  | 22 | 1  | 0  | 169 | 8                             | 11  | 35  | 0      |    |
| <i>Arundo donax</i> L.                   | Poac   | bg pg    | As-tm As-tr                      | 220        | 33 707 662                    | 173      | 47      | 7                                       | 26  | 12    | 33    | 33  | 15  | 46 | 48 | 0  | 126 | 33                            | 17  | 44  | 0      |    |
| <i>Erodium cicutarium</i> (L.) L'Hér.    | Gera   | ah bh    | Eur Afr As-tm<br>As-tr           | 219        | 32 666 596                    | 186      | 33      | 1                                       | 6   | 4     | 4     | 56  | 6   | 85 | 57 | 0  | 44  | 54                            | 39  | 80  | 2      |    |
| <i>Medicago polymorpha</i> L.            | Legu   | ah ph    | Eur Afr As-tm                    | 219        | 35 261 282                    | 186      | 33      | 3                                       | 18  | 8     | 12    | 63  | 10  | 59 | 46 | 0  | 80  | 45                            | 31  | 63  | 0      |    |
| <i>Melilotus indicus</i> (L.) All.       | Legu   | ah       | Eur Afr As-tm<br>As-tr SAM       | 219        | 29 468 034                    | 184      | 35      | 9                                       | 13  | 17    | 33    | 56  | 5   | 35 | 51 | 0  | 74  | 37                            | 34  | 72  | 2      |    |
| <i>Nasturtium officinale</i> R. Br.      | Bras   | ph       | Eur Afr As-tm<br>As-tr           | 217        | 42 197 885                    | 174      | 43      | 1                                       | 19  | 20    | 34    | 31  | 11  | 60 | 40 | 1  | 108 | 16                            | 7   | 86  | 0      |    |
| <i>Galinsoga parviflora</i> Cav.         | Comp   | ah       | NAM SAM                          | 216        | 45 833 946                    | 179      | 37      | 43                                      | 35  | 17    | 37    | 24  | 8   | 44 | 8  | 0  | 87  | 11                            | 17  | 101 | 0      |    |

| Taxon                                                   | Family | LH      | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |     |     |       |     |     |      |     | Number of regions by zoniomes |        |     |   |  |
|---------------------------------------------------------|--------|---------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-----|-----|-------|-----|-----|------|-----|-------------------------------|--------|-----|---|--|
|                                                         |        |         |                                  |            |                               |          |         | Eur                                     |     |       |     |     | As-tm |     |     |      |     | Ant                           |        |     |   |  |
|                                                         |        |         |                                  |            |                               |          |         | Eur                                     | Afr | As-tr | Aus | Pac | NAm   | SAm | Ant | I-II | III | IV                            | V-VIII | IX  |   |  |
| <i>Lepidium didymum</i> L.                              | Bras   | ah      | SAm                              | 216        | 35 396 181                    | 162      | 54      | 22                                      | 27  | 15    | 33  | 46  | 14    | 52  | 6   | 1    | 93  | 24                            | 24     | 75  | 0 |  |
| <i>Taraxacum campyloides</i> G. E. Haglund              | Comp   | ph      | Eur Afr As-tm As-tr              | 216        | 39 150 503                    | 176      | 40      | 1                                       | 11  | 9     | 4   | 36  | 12    | 91  | 49  | 3    | 73  | 36                            | 16     | 85  | 6 |  |
| <i>Physalis angulata</i> L.                             | Sola   | ah      | NAm SAm                          | 215        | 36 813 881                    | 151      | 64      | 2                                       | 49  | 19    | 37  | 28  | 46    | 8   | 26  | 0    | 162 | 19                            | 6      | 28  | 0 |  |
| <i>Leucaena leucocephala</i> (Lam.) de Wit              | Legu   | s t     | NAm SAm                          | 214        | 35 052 437                    | 109      | 105     | 1                                       | 47  | 13    | 41  | 17  | 55    | 3   | 37  | 0    | 187 | 10                            | 4      | 13  | 0 |  |
| <i>Trifolium repens</i> L.                              | Legu   | ph      | Eur Afr As-tm As-tr              | 211        | 34 744 275                    | 172      | 39      | 2                                       | 8   | 25    | 12  | 29  | 4     | 81  | 46  | 4    | 60  | 18                            | 18     | 110 | 5 |  |
| <i>Catharanthus roseus</i> (L.) G. Don                  | Apoc   | ph s    | Afr                              | 210        | 26 284 568                    | 90       | 120     | 0                                       | 76  | 14    | 11  | 16  | 59    | 12  | 22  | 0    | 175 | 9                             | 4      | 22  | 0 |  |
| <i>Avena fatua</i> L.                                   | Poac   | ag      | Eur Afr As-tm As-tr              | 208        | 41 150 737                    | 176      | 32      | 11                                      | 5   | 25    | 4   | 55  | 5     | 75  | 28  | 0    | 47  | 35                            | 23     | 102 | 1 |  |
| <i>Cyperus rotundus</i> L.                              | Cype   | ph      | Eur Afr As-tm As-tr Pac          | 208        | 21 660 549                    | 138      | 70      | 2                                       | 3   | 17    | 34  | 36  | 43    | 51  | 22  | 0    | 134 | 24                            | 6      | 44  | 0 |  |
| <i>Senna occidentalis</i> (L.) Link                     | Legu   | ah ph s | NAm SAm                          | 207        | 35 880 346                    | 135      | 72      | 0                                       | 77  | 12    | 39  | 21  | 35    | 22  | 1   | 0    | 158 | 17                            | 1      | 31  | 0 |  |
| <i>Melia azedarach</i> L.                               | Meli   | s t     | As-tm As-tr Aus Pac              | 204        | 32 456 740                    | 140      | 64      | 5                                       | 51  | 2     | 34  | 6   | 36    | 45  | 25  | 0    | 152 | 20                            | 12     | 20  | 0 |  |
| <i>Raphanus raphanistrum</i> L.                         | Bras   | ah bh   | Eur Afr As-tm                    | 204        | 32 896 470                    | 168      | 36      | 7                                       | 9   | 6     | 31  | 52  | 6     | 61  | 30  | 2    | 70  | 22                            | 29     | 81  | 2 |  |
| <i>Dactylis glomerata</i> L.                            | Poac   | pg      | Eur Afr As-tm As-tr              | 203        | 33 645 949                    | 163      | 40      | 10                                      | 7   | 24    | 8   | 32  | 6     | 74  | 38  | 4    | 49  | 17                            | 16     | 112 | 9 |  |
| <i>Dysphania ambrosioides</i> (L.) Mosyakin et Clemants | Amar   | ah s    | NAm SAm                          | 202        | 33 291 768                    | 148      | 54      | 21                                      | 51  | 5     | 10  | 33  | 8     | 48  | 26  | 0    | 105 | 17                            | 17     | 63  | 0 |  |
| <i>Eichhornia crassipes</i> (Mart.) Solms               | Pont   | ph      | SAm                              | 202        | 33 317 985                    | 154      | 48      | 6                                       | 24  | 20    | 37  | 21  | 17    | 57  | 20  | 0    | 124 | 20                            | 10     | 48  | 0 |  |
| <i>Anaranthus hybridus</i> L.                           | Amar   | ah      | NAm SAm                          | 201        | 45 653 764                    | 177      | 24      | 23                                      | 39  | 16    | 4   | 26  | 4     | 54  | 35  | 0    | 57  | 22                            | 33     | 89  | 0 |  |
| <i>Anaranthus spinosus</i> L.                           | Amar   | ah      | NAm SAm                          | 200        | 48 801 327                    | 168      | 32      | 4                                       | 48  | 21    | 39  | 11  | 16    | 39  | 22  | 0    | 122 | 11                            | 3      | 64  | 0 |  |
| <i>Ageratum conyzoides</i> (L.) L.                      | Comp   | ah ph   | SAm                              | 197        | 32 095 010                    | 121      | 76      | 0                                       | 62  | 10    | 39  | 16  | 54    | 11  | 5   | 0    | 166 | 9                             | 1      | 21  | 0 |  |
| <i>Foeniculum vulgare</i> Mill.                         | Apiac  | bh ph   | Eur Afr As-tm As-tr              | 197        | 35 726 578                    | 164      | 33      | 12                                      | 11  | 36    | 3   | 23  | 10    | 57  | 45  | 0    | 58  | 25                            | 17     | 97  | 0 |  |
| <i>Lantana camara</i> L.                                | Verb   | s       | NAm SAm                          | 197        | 33 899 768                    | 122      | 75      | 5                                       | 64  | 9     | 39  | 21  | 40    | 13  | 6   | 0    | 154 | 13                            | 12     | 18  | 0 |  |

| Taxon                                       | Family | LH    | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |       |     |     |     |     | Number of regions by zoniomes |      |     |    |        |    |
|---------------------------------------------|--------|-------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-------|-----|-----|-----|-----|-------------------------------|------|-----|----|--------|----|
|                                             |        |       |                                  |            |                               |          |         | Eur                                     | Afr | As-tm | As-tr | Aus | Pac | NAm | SAm | Ant                           | I-II | III | IV | V-VIII | IX |
| <i>Anagallis arvensis</i> L.                | Prim   | ah bh | Eur Afr As-tm As-tr              | 195        | 27 313 849                    | 154      | 41      | 3                                       | 15  | 5     | 6     | 51  | 10  | 58  | 45  | 2                             | 48   | 32  | 40 | 74     | 1  |
| <i>Brassica juncea</i> (L.) Czern.          | Bras   | ah ph | Eur As-tm                        | 195        | 49 556 415                    | 164      | 31      | 6                                       | 20  | 36    | 3     | 30  | 11  | 71  | 18  | 0                             | 59   | 21  | 10 | 105    | 0  |
| <i>Euphorbia peplus</i> L.                  | Euph   | ah    | Eur Afr As-tm As-tr              | 195        | 31 991 802                    | 160      | 35      | 16                                      | 23  | 9     | 5     | 35  | 8   | 49  | 49  | 1                             | 55   | 26  | 27 | 87     | 0  |
| <i>Anacanthus retroflexus</i> L.            | Amar   | ah    | NAm                              | 193        | 46 305 555                    | 173      | 20      | 41                                      | 10  | 28    | 1     | 25  | 1   | 65  | 22  | 0                             | 20   | 23  | 28 | 121    | 1  |
| <i>Eragrostis cilianensis</i> (All.) Janch. | Poac   | ag    | Eur Afr As-tm As-tr              | 191        | 30 768 189                    | 175      | 16      | 7                                       | 4   | 1     | 31    | 53  | 6   | 57  | 32  | 0                             | 84   | 25  | 7  | 75     | 0  |
| <i>Vulpia myuros</i> (L.) C. C. Gmel.       | Poac   | ag    | Eur Afr As-tm As-tr              | 190        | 25 676 016                    | 155      | 35      | 7                                       | 8   | 9     | 4     | 50  | 7   | 61  | 43  | 1                             | 50   | 33  | 30 | 77     | 0  |
| <i>Cirsium vulgare</i> (Savi) Ten.          | Comp   | bh    | Eur Afr As-tm As-tr              | 189        | 32 595 340                    | 164      | 25      | 3                                       | 12  | 6     | 0     | 47  | 9   | 64  | 48  | 0                             | 56   | 21  | 20 | 90     | 2  |
| <i>Convolvulus arvensis</i> L.              | Conv   | ph    | Eur Afr As-tm As-tr              | 189        | 38 071 286                    | 175      | 14      | 4                                       | 17  | 24    | 11    | 31  | 3   | 59  | 40  | 0                             | 48   | 27  | 22 | 92     | 0  |
| <i>Rumex acetosella</i> L.                  | Poly   | ph    | Eur Afr As-tm As-tr              | 188        | 32 402 187                    | 153      | 35      | 2                                       | 2   | 19    | 8     | 36  | 3   | 66  | 46  | 6                             | 39   | 17  | 25 | 101    | 6  |
| <i>Dactyloctenium aegyptium</i> (L.) Willd. | Poac   | ag pg | Eur Afr As-tm As-tr              | 186        | 19 234 210                    | 122      | 64      | 4                                       | 3   | 2     | 33    | 16  | 36  | 49  | 43  | 0                             | 138  | 21  | 6  | 21     | 0  |
| <i>Poa pratensis</i> L.                     | Poac   | bg pg | Eur Afr As-tm As-tr NAm          | 186        | 35 305 146                    | 154      | 32      | 1                                       | 4   | 25    | 3     | 28  | 3   | 75  | 41  | 6                             | 32   | 22  | 14 | 111    | 7  |
| <i>Spergula arvensis</i> L.                 | Cary   | ah    | Eur Afr As-tm                    | 186        | 38 817 548                    | 164      | 22      | 7                                       | 16  | 12    | 34    | 21  | 4   | 57  | 35  | 0                             | 72   | 4   | 17 | 91     | 2  |
| <i>Celosia argentea</i> L.                  | Amar   | ah    | cult                             | 185        | 49 536 666                    | 156      | 29      | 1                                       | 36  | 33    | 36    | 5   | 14  | 24  | 36  | 0                             | 114  | 9   | 1  | 61     | 0  |
| <i>Carica papaya</i> L.                     | Cari   | s t   | NAm SAm                          | 184        | 22 975 791                    | 63       | 121     | 0                                       | 45  | 5     | 5     | 5   | 75  | 2   | 47  | 0                             | 171  | 1   | 1  | 11     | 0  |
| <i>Veronica persica</i> Poir.               | Plan   | ah    | Eur Afr As-tm                    | 183        | 35 973 228                    | 150      | 33      | 40                                      | 13  | 14    | 3     | 25  | 0   | 59  | 29  | 0                             | 25   | 16  | 30 | 109    | 3  |
| <i>Sisymbrium officinale</i> (L.) Scop.     | Bras   | ah    | Eur Afr As-tm As-tr              | 181        | 36 586 736                    | 155      | 26      | 9                                       | 9   | 17    | 2     | 30  | 6   | 64  | 44  | 0                             | 41   | 15  | 20 | 103    | 2  |
| <i>Setaria verticillata</i> (L.) P. Beauv.  | Poac   | ag    | Eur Afr As-tm As-tr NAm SAm      | 180        | 27 806 080                    | 137      | 43      | 13                                      | 5   | 4     | 7     | 43  | 24  | 64  | 20  | 0                             | 61   | 40  | 12 | 67     | 0  |
| <i>Vicia sativa</i> L.                      | Legu   | ah    | Eur Afr As-tm As-tr              | 180        | 39 145 059                    | 156      | 24      | 14                                      | 15  | 20    | 14    | 26  | 0   | 71  | 20  | 0                             | 38   | 18  | 26 | 97     | 1  |

| Taxon                                     | Family | LH       | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |       |     |     |     |     | Number of regions by zoniomes |     |    |        |     |     |
|-------------------------------------------|--------|----------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-------|-----|-----|-----|-----|-------------------------------|-----|----|--------|-----|-----|
|                                           |        |          |                                  |            |                               |          |         | Eur Afr As-tm As-tr Aus Pac NAm SAM Ant |     |       |       |     |     |     |     | I-II                          | III | IV | V-VIII | IX  |     |
|                                           |        |          |                                  |            |                               |          |         | Eur                                     | Afr | As-tm | As-tr | Aus | Pac | NAm | SAM |                               |     |    |        |     | Ant |
| <i>Lactuca serriola</i> L.                | Comp   | ah bh    | Eur Afr As-tm As-tr              | 179        | 32 279 115                    | 167      | 12      | 19                                      | 13  | 10    | 0     | 51  | 0   | 59  | 27  | 0                             | 37  | 28 | 21     | 93  | 0   |
| <i>Medicago lupulina</i> L.               | Legu   | ah ph    | Eur Afr As-tm As-tr              | 177        | 32 367 512                    | 154      | 23      | 2                                       | 13  | 6     | 11    | 28  | 6   | 64  | 47  | 0                             | 54  | 17 | 20     | 84  | 2   |
| <i>Hibiscus trionum</i> L.                | Malv   | ah       | Eur Afr As-tm As-tr              | 175        | 40 333 284                    | 165      | 10      | 9                                       | 14  | 35    | 31    | 28  | 0   | 57  | 1   | 0                             | 51  | 20 | 10     | 94  | 0   |
| <i>Ipomoea purpurea</i> (L.) Roth         | Conv   | ah       | NAm SAM                          | 175        | 39 033 693                    | 155      | 20      | 13                                      | 21  | 39    | 34    | 12  | 1   | 50  | 5   | 0                             | 65  | 8  | 11     | 91  | 0   |
| <i>Pennisetum purpureum</i> Schumach.     | Poac   | bg pg    | Afr                              | 175        | 29 834 308                    | 125      | 50      | 0                                       | 38  | 11    | 37    | 13  | 20  | 23  | 33  | 0                             | 143 | 9  | 8      | 15  | 0   |
| <i>Ipomoea batatas</i> (L.) Lam.          | Conv   | ah ph    | NAm                              | 173        | 33 897 846                    | 104      | 69      | 0                                       | 37  | 34    | 4     | 7   | 45  | 12  | 34  | 0                             | 114 | 7  | 2      | 50  | 0   |
| <i>Ipomoea nil</i> (L.) Roth              | Conv   | ah       | NAm SAM                          | 173        | 36 477 091                    | 154      | 19      | 4                                       | 25  | 27    | 36    | 11  | 0   | 35  | 35  | 0                             | 93  | 13 | 5      | 62  | 0   |
| <i>Capsicum annuum</i> L.                 | Sola   | ah ph s  | NAm SAM                          | 172        | 34 231 391                    | 94       | 78      | 2                                       | 40  | 34    | 5     | 9   | 56  | 13  | 13  | 0                             | 113 | 8  | 4      | 47  | 0   |
| <i>Cyanthillium cinereum</i> (L.) H. Rob. | Comp   | ah       | Afr As-tm As-tr Aus              | 172        | 17 532 026                    | 58       | 114     | 0                                       | 60  | 9     | 7     | 5   | 59  | 7   | 25  | 0                             | 155 | 7  | 1      | 9   | 0   |
| <i>Bromus catharticus</i> Vahl            | Poac   | ag bg pg | SAM                              | 171        | 26 459 142                    | 140      | 31      | 16                                      | 27  | 9     | 4     | 47  | 7   | 58  | 2   | 1                             | 56  | 37 | 18     | 60  | 0   |
| <i>Conium maculatum</i> L.                | Apia   | bh       | Eur Afr As-tm As-tr              | 171        | 31 229 451                    | 154      | 17      | 8                                       | 12  | 12    | 0     | 31  | 0   | 62  | 46  | 0                             | 33  | 19 | 24     | 93  | 2   |
| <i>Marrubium vulgare</i> L.               | Lami   | ph       | Eur Afr As-tm As-tr              | 171        | 22 601 457                    | 155      | 16      | 6                                       | 3   | 1     | 0     | 41  | 2   | 73  | 45  | 0                             | 39  | 40 | 24     | 68  | 0   |
| <i>Cichorium intybus</i> L.               | Comp   | bh ph    | Eur Afr As-tm As-tr              | 170        | 29 918 006                    | 147      | 23      | 8                                       | 15  | 12    | 5     | 33  | 1   | 62  | 34  | 0                             | 40  | 17 | 21     | 92  | 0   |
| <i>Senecio vulgaris</i> L.                | Comp   | ah bh    | Eur Afr As-tm As-tr              | 169        | 35 005 093                    | 143      | 26      | 4                                       | 8   | 22    | 5     | 16  | 2   | 82  | 28  | 2                             | 28  | 19 | 18     | 101 | 3   |
| <i>Sida rhombifolia</i> L.                | Malv   | ah ph s  | Afr As-tm As-tr NAm SAM          | 169        | 14 193 615                    | 77       | 92      | 2                                       | 9   | 10    | 32    | 27  | 77  | 9   | 3   | 0                             | 139 | 6  | 3      | 21  | 0   |
| <i>Xanthium spinosum</i> L.               | Comp   | ah       | SAM                              | 169        | 26 964 940                    | 155      | 14      | 21                                      | 17  | 12    | 0     | 44  | 0   | 47  | 28  | 0                             | 33  | 32 | 31     | 73  | 0   |
| <i>Coix lacryna-jobi</i> L.               | Poac   | ag pg    | As-tm As-tr                      | 168        | 26 969 390                    | 124      | 44      | 2                                       | 27  | 25    | 33    | 5   | 30  | 15  | 31  | 0                             | 125 | 3  | 3      | 37  | 0   |
| <i>Anthemis cotula</i> L.                 | Comp   | ah       | Eur Afr As-tm As-tr              | 167        | 25 492 627                    | 143      | 24      | 11                                      | 11  | 8     | 3     | 19  | 4   | 65  | 44  | 2                             | 34  | 18 | 20     | 93  | 2   |
| <i>Cenchrus echinatus</i> L.              | Poac   | ag       | NAm SAM                          | 167        | 11 170 657                    | 71       | 96      | 0                                       | 7   | 5     | 5     | 41  | 87  | 4   | 18  | 0                             | 127 | 22 | 8      | 10  | 0   |



| Taxon                                                         | Family | LH       | Continent of native distribution   | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |     |     |       |     |     |       |     | Number of regions by zoniomes |     |     |     |  |      |     |    |        |    |
|---------------------------------------------------------------|--------|----------|------------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-----|-----|-------|-----|-----|-------|-----|-------------------------------|-----|-----|-----|--|------|-----|----|--------|----|
|                                                               |        |          |                                    |            |                               |          |         | Eur                                     |     |       |     |     | As-tr |     |     |       |     | Ant                           |     |     |     |  | I-II | III | IV | V-VIII | IX |
|                                                               |        |          |                                    |            |                               |          |         | Eur                                     | Afr | As-tr | Aus | Pac | NAm   | SAm | Ant | As-tr | Aus | Pac                           | NAm | SAm | Ant |  |      |     |    |        |    |
| <i>Silybum marianum</i> (L.) Gaertn.                          | Comp   | ah bh    | Eur Afr As-tr                      | 167        | 30 907 784                    | 147      | 20      | 9                                       | 7   | 34    | 0   | 38  | 0     | 41  | 38  | 0     | 35  | 17                            | 19  | 95  | 1   |  |      |     |    |        |    |
| <i>Trifolium pratense</i> L.                                  | Legu   | bh ph    | Eur Afr As-tr<br>As-tr NAm         | 166        | 31 972 827                    | 138      | 28      | 7                                       | 10  | 25    | 8   | 18  | 0     | 66  | 32  | 0     | 34  | 8                             | 12  | 105 | 7   |  |      |     |    |        |    |
| <i>Psidium guajava</i> L.                                     | Myrt   | t        | NAm SAm                            | 165        | 26 292 569                    | 71       | 94      | 1                                       | 47  | 7     | 7   | 10  | 60    | 3   | 30  | 0     | 144 | 5                             | 1   | 15  | 0   |  |      |     |    |        |    |
| <i>Raphanus raphanistrum</i> subsp. <i>sativus</i> (L.) Domin | Bras   | ah bh    | Eur Afr As-tr<br>As-tr             | 165        | 31 438 514                    | 122      | 43      | 4                                       | 13  | 4     | 1   | 11  | 19    | 63  | 50  | 0     | 51  | 13                            | 21  | 78  | 2   |  |      |     |    |        |    |
| <i>Asclepias curassavica</i> L.                               | Apoc   | ph s     | NAm SAm                            | 164        | 22 178 624                    | 105      | 59      | 2                                       | 21  | 17    | 39  | 26  | 41    | 5   | 13  | 0     | 124 | 7                             | 10  | 23  | 0   |  |      |     |    |        |    |
| <i>Urtica urens</i> L.                                        | Urti   | ah       | Eur                                | 164        | 31 823 784                    | 136      | 28      | 9                                       | 7   | 3     | 0   | 50  | 2     | 44  | 49  | 0     | 42  | 29                            | 23  | 67  | 3   |  |      |     |    |        |    |
| <i>Nerium oleander</i> L.                                     | Apoc   | s t      | Eur Afr As-tr<br>As-tr             | 162        | 19 263 008                    | 103      | 59      | 0                                       | 29  | 2     | 33  | 17  | 36    | 32  | 13  | 0     | 125 | 21                            | 4   | 12  | 0   |  |      |     |    |        |    |
| <i>Nicandra physalodes</i> (L.) Gaertn.                       | Sola   | ah       | SAm                                | 162        | 32 296 818                    | 130      | 32      | 15                                      | 38  | 9     | 3   | 27  | 7     | 46  | 17  | 0     | 71  | 11                            | 8   | 72  | 0   |  |      |     |    |        |    |
| <i>Rapistrum rugosum</i> (L.) All.                            | Bras   | ah       | Eur Afr As-tr                      | 162        | 24 300 462                    | 147      | 15      | 15                                      | 7   | 20    | 1   | 43  | 1     | 32  | 43  | 0     | 39  | 30                            | 23  | 69  | 1   |  |      |     |    |        |    |
| <i>Fallopia convolvulus</i> (L.) Á. Löve                      | Poly   | ah       | Eur Afr As-tr<br>As-tr             | 161        | 26 887 902                    | 135      | 26      | 14                                      | 4   | 9     | 1   | 30  | 1     | 66  | 36  | 0     | 36  | 11                            | 17  | 90  | 7   |  |      |     |    |        |    |
| <i>Malvastrum coromandelianum</i> (L.) Garcke                 | Malv   | ah ph s  | NAm SAm                            | 161        | 16 300 376                    | 78       | 83      | 0                                       | 29  | 7     | 35  | 17  | 65    | 7   | 1   | 0     | 138 | 9                             | 1   | 13  | 0   |  |      |     |    |        |    |
| <i>Phyllanthus amarus</i> Schumach. et Thonn.                 | Phyl   | ah       | NAm SAm                            | 161        | 17 272 114                    | 34       | 127     | 0                                       | 48  | 5     | 8   | 9   | 85    | 3   | 3   | 0     | 148 | 5                             | 0   | 8   | 0   |  |      |     |    |        |    |
| <i>Setaria viridis</i> (L.) P. Beauv.                         | Poac   | ag pg    | Eur Afr As-tr<br>As-tr             | 161        | 39 522 796                    | 145      | 16      | 15                                      | 2   | 31    | 2   | 16  | 1     | 73  | 21  | 0     | 24  | 21                            | 5   | 111 | 0   |  |      |     |    |        |    |
| <i>Achyranthes aspera</i> L.                                  | Amar   | ah ph s  | Eur Afr As-tr<br>As-tr Aus NAm SAm | 160        | 19 481 863                    | 80       | 80      | 1                                       | 52  | 12    | 32  | 1   | 37    | 6   | 19  | 0     | 137 | 3                             | 3   | 17  | 0   |  |      |     |    |        |    |
| <i>Hypochaeris radicata</i> L.                                | Comp   | ph       | Eur                                | 160        | 22 640 045                    | 131      | 29      | 0                                       | 11  | 3     | 2   | 39  | 9     | 52  | 43  | 1     | 46  | 15                            | 20  | 76  | 3   |  |      |     |    |        |    |
| <i>Lolium multiflorum</i> Lam.                                | Poac   | bg pg    | Eur Afr As-tr<br>As-tr             | 160        | 20 535 814                    | 135      | 25      | 27                                      | 14  | 16    | 1   | 27  | 5     | 17  | 51  | 2     | 49  | 21                            | 20  | 68  | 2   |  |      |     |    |        |    |
| <i>Malva parviflora</i> L.                                    | Malv   | ah bh ph | Eur Afr As-tr                      | 160        | 29 020 388                    | 126      | 34      | 2                                       | 12  | 2     | 12  | 62  | 10    | 37  | 22  | 1     | 54  | 36                            | 25  | 45  | 0   |  |      |     |    |        |    |
| <i>Citrullus lanatus</i> (Thunb.) Matsum. et Nakai            | Cucu   | ah       | Afr                                | 159        | 24 482 573                    | 120      | 39      | 5                                       | 9   | 0     | 12  | 53  | 25    | 40  | 15  | 0     | 76  | 31                            | 11  | 41  | 0   |  |      |     |    |        |    |

| Taxon                                         | Family | LH    | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |       |     |     |     |     |     |      | Number of regions by zoniomes |    |        |    |  |
|-----------------------------------------------|--------|-------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-------|-----|-----|-----|-----|-----|------|-------------------------------|----|--------|----|--|
|                                               |        |       |                                  |            |                               |          |         |                                         |     |       |       |     |     |     |     |     |      |                               |    |        |    |  |
|                                               |        |       |                                  |            |                               |          |         | Eur                                     | Afr | As-tm | As-tr | Aus | Pac | NAm | SAm | Ant | I-II | III                           | IV | V-VIII | IX |  |
| <i>Salsola kali</i> L.                        | Amar   | ah    | Eur Afr As-tm As-tr              | 159        | 24 656 147                    | 138      | 21      | 5                                       | 11  | 2     | 0     | 33  | 5   | 79  | 24  | 0   | 24   | 34                            | 29 | 72     | 0  |  |
| <i>Polypogon monspeliensis</i> (L.) Desf.     | Poac   | ag    | Eur Afr As-tm As-tr              | 158        | 30 581 632                    | 142      | 16      | 5                                       | 13  | 0     | 6     | 52  | 5   | 49  | 27  | 1   | 41   | 34                            | 25 | 58     | 0  |  |
| <i>Avena sativa</i> L.                        | Poac   | ag    | Eur As-tm                        | 157        | 32 754 421                    | 127      | 30      | 9                                       | 14  | 6     | 4     | 31  | 5   | 64  | 24  | 0   | 39   | 21                            | 10 | 85     | 2  |  |
| <i>Daucus carota</i> L.                       | Apiac  | bh    | Eur Afr As-tm As-tr              | 157        | 31 387 224                    | 136      | 21      | 4                                       | 4   | 34    | 2     | 17  | 7   | 61  | 28  | 0   | 29   | 7                             | 21 | 99     | 1  |  |
| <i>Cannabis sativa</i> L.                     | Cannab | ah    | As-tm                            | 156        | 37 054 653                    | 122      | 34      | 11                                      | 30  | 14    | 6     | 12  | 22  | 57  | 4   | 0   | 67   | 6                             | 6  | 77     | 0  |  |
| <i>Holcus lanatus</i> L.                      | Poac   | pg    | Eur Afr As-tm                    | 156        | 24 623 567                    | 125      | 31      | 2                                       | 8   | 8     | 2     | 29  | 5   | 58  | 38  | 6   | 37   | 11                            | 17 | 88     | 3  |  |
| <i>Argemone mexicana</i> L.                   | Papa   | ah    | NAm SAm                          | 155        | 30 592 463                    | 131      | 24      | 1                                       | 42  | 8     | 36    | 7   | 8   | 30  | 23  | 0   | 106  | 8                             | 3  | 38     | 0  |  |
| <i>Agrostis stolonifera</i> L.                | Poac   | pg    | Eur Afr As-tm As-tr NAm          | 154        | 31 946 057                    | 121      | 33      | 0                                       | 2   | 21    | 2     | 14  | 5   | 70  | 35  | 5   | 20   | 13                            | 10 | 106    | 5  |  |
| <i>Bromus hordeaceus</i> L.                   | Poac   | ag bg | Eur Afr As-tm As-tr              | 154        | 23 145 853                    | 122      | 32      | 0                                       | 9   | 5     | 1     | 42  | 5   | 56  | 35  | 1   | 27   | 18                            | 32 | 75     | 2  |  |
| <i>Centaurea melitensis</i> L.                | Comp   | ah bh | Eur Afr                          | 154        | 18 440 869                    | 135      | 19      | 0                                       | 11  | 1     | 0     | 56  | 8   | 25  | 53  | 0   | 51   | 37                            | 32 | 34     | 0  |  |
| <i>Lolium temulentum</i> L.                   | Poac   | ag    | Eur Afr As-tm                    | 154        | 30 958 614                    | 136      | 18      | 8                                       | 13  | 17    | 4     | 27  | 1   | 56  | 28  | 0   | 36   | 17                            | 14 | 86     | 1  |  |
| <i>Robinia pseudoacacia</i> L.                | Legu   | t     | NAm                              | 154        | 29 969 544                    | 136      | 18      | 39                                      | 9   | 37    | 1     | 24  | 0   | 40  | 4   | 0   | 16   | 14                            | 24 | 100    | 0  |  |
| <i>Clitoria ternatea</i> L.                   | Legu   | ph    | SAm                              | 152        | 29 795 074                    | 105      | 47      | 0                                       | 29  | 8     | 36    | 14  | 15  | 14  | 36  | 0   | 126  | 15                            | 1  | 10     | 0  |  |
| <i>Eragrostis amabilis</i> (L.) Wight et Arn. | Poac   | ag pg | Afr As-tm As-tr Pac              | 152        | 20 294 196                    | 76       | 76      | 0                                       | 3   | 0     | 32    | 7   | 63  | 9   | 38  | 0   | 139  | 4                             | 1  | 8      | 0  |  |
| <i>Rumex obtusifolius</i> L.                  | Poly   | ph    | Eur Afr As-tm                    | 152        | 27 450 191                    | 128      | 24      | 5                                       | 3   | 3     | 3     | 19  | 3   | 80  | 33  | 3   | 41   | 22                            | 6  | 82     | 1  |  |
| <i>Lamium amplexicaule</i> L.                 | Lami   | ah bh | Eur Afr As-tm As-tr              | 151        | 29 805 342                    | 130      | 21      | 12                                      | 12  | 1     | 0     | 35  | 2   | 64  | 25  | 0   | 37   | 16                            | 15 | 76     | 7  |  |
| <i>Casuarina equisetifolia</i> L.             | Casu   | t     | As-tr Aus Pac                    | 150        | 12 013 439                    | 60       | 90      | 0                                       | 27  | 7     | 12    | 2   | 64  | 23  | 15  | 0   | 129  | 11                            | 4  | 6      | 0  |  |
| <i>Euphorbia cyathophora</i> Murray           | Euph   | ah ph | NAm SAm                          | 150        | 17 529 303                    | 89       | 61      | 0                                       | 32  | 16    | 35    | 18  | 40  | 5   | 4   | 0   | 119  | 7                             | 3  | 21     | 0  |  |
| <i>Panicum maximum</i> Jacq.                  | Poac   | bg pg | Afr As-tm                        | 150        | 17 732 347                    | 70       | 80      | 0                                       | 26  | 2     | 20    | 28  | 33  | 8   | 33  | 0   | 126  | 7                             | 5  | 12     | 0  |  |
| <i>Silene gallica</i> L.                      | Cary   | ah bh | Eur Afr As-tm                    | 150        | 17 261 060                    | 123      | 27      | 9                                       | 5   | 3     | 7     | 44  | 7   | 28  | 47  | 0   | 44   | 19                            | 28 | 59     | 0  |  |
| <i>Tamarindus indica</i> L.                   | Legu   | t     | Afr As-tm                        | 150        | 31 988 452                    | 98       | 52      | 0                                       | 48  | 7     | 4     | 8   | 23  | 19  | 41  | 0   | 131  | 8                             | 1  | 10     | 0  |  |
| <i>Pistia stratiotes</i> L.                   | Arac   | ph    | Afr As-tm As-tr Aus NAm SAm      | 148        | 30 341 551                    | 131      | 17      | 4                                       | 33  | 13    | 37    | 9   | 8   | 41  | 3   | 0   | 99   | 9                             | 5  | 35     | 0  |  |

| Taxon                                      | Family | LH    | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |       |     |     |     |     |     |      | Number of regions by zoniomes |    |        |    |  |
|--------------------------------------------|--------|-------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-------|-----|-----|-----|-----|-----|------|-------------------------------|----|--------|----|--|
|                                            |        |       |                                  |            |                               |          |         | Number of regions invaded on continents |     |       |       |     |     |     |     |     |      | Number of regions by zoniomes |    |        |    |  |
|                                            |        |       |                                  |            |                               |          |         | Eur                                     | Afr | As-tm | As-tr | Aus | Pac | NAm | SAm | Ant | I-II | III                           | IV | V-VIII | IX |  |
| <i>Canna indica</i> L.                     | Cannae | ph    | NAm SAm                          | 147        | 29 525 579                    | 85       | 62      | 4                                       | 37  | 33    | 9     | 9   | 38  | 8   | 9   | 0   | 97   | 2                             | 5  | 43     | 0  |  |
| <i>Nicotiana glauca</i> Graham             | Sola   | s t   | SAm                              | 147        | 26 252 070                    | 120      | 27      | 10                                      | 30  | 3     | 5     | 45  | 7   | 12  | 35  | 0   | 65   | 38                            | 27 | 17     | 0  |  |
| <i>Nicotiana tabacum</i> L.                | Sola   | ah ph | NAm                              | 147        | 26 514 592                    | 66       | 81      | 5                                       | 34  | 4     | 5     | 9   | 51  | 15  | 24  | 0   | 105  | 5                             | 9  | 28     | 0  |  |
| <i>Sorghum bicolor</i> (L.) Moench         | Poae   | ag pg | Afr                              | 147        | 33 957 680                    | 117      | 30      | 8                                       | 12  | 2     | 5     | 34  | 9   | 57  | 20  | 0   | 62   | 20                            | 7  | 58     | 0  |  |
| <i>Xanthium strumarium</i> L.              | Comp   | ah    | Eur Afr As-tm As-tr NAm SAm      | 147        | 21 817 390                    | 115      | 32      | 19                                      | 18  | 9     | 33    | 43  | 16  | 1   | 8   | 0   | 88   | 20                            | 7  | 32     | 0  |  |
| <i>Antigonon leptopus</i> Hook. et Arn.    | Poly   | ph    | NAm SAm                          | 146        | 19 725 809                    | 81       | 65      | 0                                       | 22  | 3     | 35    | 10  | 35  | 8   | 33  | 0   | 127  | 6                             | 0  | 13     | 0  |  |
| <i>Cerastium glomeratum</i> Thuill.        | Cary   | ah    | Eur Afr As-tm As-tr              | 146        | 24 920 389                    | 125      | 21      | 2                                       | 2   | 3     | 4     | 44  | 1   | 49  | 39  | 2   | 36   | 20                            | 20 | 69     | 1  |  |
| <i>Mentha spicata</i> L.                   | Lami   | ph    | Eur As-tm                        | 146        | 32 193 013                    | 110      | 36      | 24                                      | 8   | 11    | 1     | 22  | 12  | 59  | 9   | 0   | 29   | 9                             | 14 | 94     | 0  |  |
| <i>Tridax procumbens</i> (L.) L.           | Comp   | ph    | NAm SAm                          | 146        | 23 964 688                    | 91       | 55      | 0                                       | 55  | 4     | 40    | 18  | 28  | 0   | 1   | 0   | 132  | 11                            | 1  | 2      | 0  |  |
| <i>Galinosa quadriradiata</i> Ruiz et Pav. | Comp   | ah    | NAm                              | 145        | 29 992 102                    | 117      | 28      | 39                                      | 21  | 14    | 7     | 1   | 4   | 50  | 9   | 0   | 33   | 0                             | 8  | 104    | 0  |  |
| <i>Linum usitatissimum</i> L.              | Lina   | ah    | cult                             | 145        | 34 423 273                    | 126      | 19      | 13                                      | 4   | 35    | 1     | 22  | 0   | 59  | 11  | 0   | 19   | 8                             | 14 | 104    | 0  |  |
| <i>Phalaris canariensis</i> L.             | Poae   | ag    | Eur Afr                          | 145        | 28 514 531                    | 119      | 26      | 22                                      | 14  | 5     | 1     | 23  | 0   | 62  | 18  | 0   | 27   | 7                             | 22 | 87     | 2  |  |
| <i>Bryophyllum pinnatum</i> (Lam.) Oken    | Cras   | ph    | Afr                              | 143        | 12 842 328                    | 56       | 87      | 1                                       | 38  | 4     | 23    | 12  | 34  | 1   | 30  | 0   | 131  | 0                             | 1  | 11     | 0  |  |
| <i>Mangifera indica</i> L.                 | Anac   | t     | As-tr                            | 143        | 17 707 307                    | 53       | 90      | 0                                       | 47  | 5     | 0     | 9   | 58  | 2   | 22  | 0   | 135  | 3                             | 0  | 5      | 0  |  |
| <i>Synedrella nodiflora</i> (L.) Gaertn.   | Comp   | ah ph | NAm SAm                          | 143        | 18 673 592                    | 66       | 77      | 0                                       | 33  | 6     | 40    | 7   | 55  | 1   | 1   | 0   | 134  | 3                             | 0  | 6      | 0  |  |
| <i>Momordica charantia</i> L.              | Cucu   | ah    | Afr As-tm As-tr Aus Pac          | 142        | 31 829 783                    | 101      | 41      | 0                                       | 33  | 6     | 3     | 8   | 25  | 29  | 38  | 0   | 114  | 11                            | 0  | 17     | 0  |  |
| <i>Cenchrus ciliaris</i> L.                | Poae   | bg pg | Eur Afr As-tm As-tr              | 141        | 20 156 461                    | 114      | 27      | 1                                       | 7   | 1     | 4     | 50  | 12  | 39  | 27  | 0   | 82   | 40                            | 8  | 11     | 0  |  |
| <i>Leucanthemum vulgare</i> (Vaill.) Lam.  | Comp   | ph    | Eur As-tm NAm                    | 141        | 27 490 636                    | 114      | 27      | 8                                       | 8   | 8     | 10    | 12  | 4   | 64  | 25  | 2   | 32   | 6                             | 10 | 84     | 9  |  |
| <i>Lobularia maritima</i> (L.) Desv.       | Bras   | ah ph | Eur Afr As-tm                    | 141        | 21 645 056                    | 115      | 26      | 12                                      | 13  | 9     | 0     | 22  | 7   | 53  | 25  | 0   | 36   | 17                            | 17 | 71     | 0  |  |
| <i>Vinca major</i> L.                      | Apoc   | ph s  | Eur As-tm                        | 141        | 19 100 264                    | 118      | 23      | 18                                      | 9   | 2     | 6     | 29  | 1   | 48  | 28  | 0   | 38   | 20                            | 27 | 56     | 0  |  |
| <i>Briza minor</i> L.                      | Poae   | ag    | Eur Afr As-tm                    | 140        | 15 647 893                    | 115      | 25      | 3                                       | 15  | 7     | 7     | 39  | 7   | 24  | 38  | 0   | 49   | 17                            | 26 | 48     | 0  |  |
| <i>Gomphrena globosa</i> L.                | Amar   | ah    | SAm                              | 140        | 24 320 625                    | 85       | 55      | 0                                       | 13  | 34    | 8     | 0   | 34  | 19  | 32  | 0   | 93   | 2                             | 0  | 45     | 0  |  |

| Taxon                                          | Family | LH    | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |     |       |       |     |     |     |     | Number of regions by zoniomes |      |     |    |        |    |
|------------------------------------------------|--------|-------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-----|-------|-------|-----|-----|-----|-----|-------------------------------|------|-----|----|--------|----|
|                                                |        |       |                                  |            |                               |          |         |                                         |     |       |       |     |     |     |     |                               |      |     |    |        |    |
|                                                |        |       |                                  |            |                               |          |         | Eur                                     | Afr | As-tm | As-tr | Aus | Pac | NAm | SAm | Ant                           | I-II | III | IV | V-VIII | IX |
| <i>Helianthus tuberosus</i> L.                 | Comp   | ph    | NAm                              | 140        | 30 212 811                    | 119      | 21      | 40                                      | 5   | 46    | 1     | 7   | 0   | 33  | 8   | 0                             | 7    | 6   | 16 | 111    | 0  |
| <i>Vaccaria hispanica</i> (Mill.) Rauschert    | Cary   | ah    | Eur Afr As-tm                    | 140        | 26 223 559                    | 131      | 9       | 5                                       | 8   | 6     | 31    | 24  | 0   | 57  | 9   | 0                             | 49   | 12  | 8  | 71     | 0  |
| <i>Albizia lebeck</i> (L.) Benth.              | Legu   | t     | As-tm As-tr Aus SAm              | 139        | 21 304 895                    | 87       | 52      | 0                                       | 32  | 7     | 34    | 5   | 27  | 17  | 17  | 0                             | 121  | 12  | 0  | 6      | 0  |
| <i>Opuntia ficus-indica</i> (L.) Mill.         | Cact   | s     | SAm                              | 139        | 33 129 116                    | 104      | 35      | 11                                      | 40  | 9     | 7     | 14  | 9   | 11  | 38  | 0                             | 79   | 20  | 17 | 23     | 0  |
| <i>Paspalum dilatatum</i> Poir.                | Poac   | pg    | SAm                              | 139        | 25 435 954                    | 104      | 35      | 10                                      | 23  | 12    | 4     | 44  | 14  | 26  | 5   | 1                             | 61   | 19  | 19 | 40     | 0  |
| <i>Trifolium dubium</i> Sibth.                 | Legu   | ah    | Eur Afr As-tm                    | 139        | 20 089 327                    | 119      | 20      | 0                                       | 4   | 3     | 10    | 36  | 3   | 52  | 30  | 1                             | 37   | 12  | 22 | 67     | 1  |
| <i>Arachis hypogaea</i> L.                     | Legu   | ah ph | cult                             | 138        | 25 745 734                    | 118      | 20      | 0                                       | 27  | 22    | 2     | 2   | 10  | 40  | 35  | 0                             | 80   | 8   | 0  | 50     | 0  |
| <i>Datura metel</i> L.                         | Sola   | ah    | SAm                              | 138        | 23 090 611                    | 79       | 59      | 0                                       | 51  | 9     | 35    | 10  | 21  | 0   | 12  | 0                             | 113  | 9   | 8  | 8      | 0  |
| <i>Sisymbrium orientale</i> L.                 | Bras   | ah    | Eur Afr As-tm                    | 138        | 21 508 729                    | 121      | 17      | 14                                      | 9   | 6     | 1     | 60  | 0   | 14  | 34  | 0                             | 35   | 37  | 26 | 40     | 0  |
| <i>Vulpia bromoides</i> (L.) Gray              | Poac   | ag    | Eur Afr As-tm                    | 138        | 17 328 111                    | 114      | 24      | 0                                       | 6   | 2     | 2     | 37  | 6   | 37  | 45  | 3                             | 40   | 20  | 22 | 54     | 2  |
| <i>Eragrostis pilosa</i> (L.) P. Beauv.        | Poac   | ag    | Eur Afr As-tm As-tr NAm          | 137        | 24 415 336                    | 117      | 20      | 14                                      | 3   | 0     | 2     | 21  | 6   | 45  | 46  | 0                             | 64   | 8   | 4  | 61     | 0  |
| <i>Sida acuta</i> Burm. f.                     | Malv   | ph s  | As-tm As-tr NAm SAm              | 137        | 10 319 271                    | 62       | 75      | 0                                       | 25  | 8     | 32    | 16  | 47  | 8   | 1   | 0                             | 116  | 8   | 1  | 12     | 0  |
| <i>Eclipta prostrata</i> (L.) L.               | Comp   | ah ph | NAm SAm                          | 135        | 26 357 515                    | 86       | 49      | 6                                       | 45  | 5     | 35    | 1   | 37  | 4   | 2   | 0                             | 108  | 10  | 7  | 10     | 0  |
| <i>Brassica nigra</i> (L.) K. Koch             | Bras   | ah    | Eur Afr As-tm                    | 134        | 31 424 504                    | 116      | 18      | 10                                      | 8   | 8     | 0     | 10  | 5   | 78  | 15  | 0                             | 24   | 20  | 7  | 83     | 0  |
| <i>Euphorbia helioscopia</i> L.                | Euph   | ah    | Eur Afr As-tm As-tr              | 134        | 28 288 358                    | 118      | 16      | 10                                      | 11  | 25    | 8     | 24  | 0   | 44  | 12  | 0                             | 28   | 11  | 12 | 83     | 0  |
| <i>Euphorbia heterophylla</i> L.               | Euph   | ah ph | NAm SAm                          | 132        | 28 710 659                    | 106      | 26      | 0                                       | 41  | 20    | 38    | 14  | 14  | 1   | 4   | 0                             | 102  | 14  | 2  | 14     | 0  |
| <i>Pennisetum glaucum</i> (L.) R. Br.          | Poac   | ag pg | Afr                              | 132        | 30 129 746                    | 121      | 11      | 0                                       | 19  | 33    | 33    | 9   | 6   | 21  | 11  | 0                             | 70   | 5   | 4  | 53     | 0  |
| <i>Coriandrum sativum</i> L.                   | Apiac  | ah    | Eur                              | 131        | 30 630 213                    | 105      | 26      | 12                                      | 14  | 37    | 3     | 14  | 5   | 35  | 11  | 0                             | 29   | 12  | 6  | 84     | 0  |
| <i>Phleum pratense</i> L.                      | Poac   | pg    | Eur Afr As-tm As-tr              | 131        | 24 412 421                    | 97       | 34      | 8                                       | 1   | 24    | 1     | 16  | 3   | 66  | 10  | 2                             | 11   | 7   | 8  | 96     | 9  |
| <i>Setaria pumila</i> (Poir.) Roem. et Schult. | Poac   | ag    | Eur Afr As-tm                    | 131        | 21 457 986                    | 104      | 27      | 7                                       | 3   | 8     | 0     | 32  | 12  | 60  | 9   | 0                             | 38   | 14  | 7  | 72     | 0  |
| <i>Tribulus terrestris</i> L.                  | Zygo   | ah    | Eur Afr As-tm As-tr Pac          | 130        | 19 231 132                    | 122      | 8       | 3                                       | 1   | 0     | 32    | 26  | 5   | 44  | 19  | 0                             | 56   | 27  | 1  | 46     | 0  |
| <i>Trifolium hybridum</i> L.                   | Legu   | ah ph | Eur Afr As-tm                    | 130        | 26 633 310                    | 106      | 24      | 25                                      | 2   | 18    | 7     | 10  | 1   | 65  | 2   | 0                             | 15   | 4   | 4  | 102    | 5  |

| Taxon                                                          | Family | LH       | Continent of native distribution | Regs total | Area total (km <sup>2</sup> ) | Main reg | Isl reg | Number of regions invaded on continents |       |       |     |     |     |     |     | Number of regions by zoniomes |     |    |        |     |   |
|----------------------------------------------------------------|--------|----------|----------------------------------|------------|-------------------------------|----------|---------|-----------------------------------------|-------|-------|-----|-----|-----|-----|-----|-------------------------------|-----|----|--------|-----|---|
|                                                                |        |          |                                  |            |                               |          |         | Eur                                     |       |       |     |     |     |     |     | Number of regions by zoniomes |     |    |        |     |   |
|                                                                |        |          |                                  |            |                               |          |         | Afr                                     | As-tm | As-tr | Aus | Pac | NAm | SAm | Ant | I-II                          | III | IV | V-VIII | IX  |   |
| <i>Urena lobata</i> L.                                         | Malv   | s        | As-tm<br>SAM                     | 130        | 24 335 279                    | 88       | 42      | 0                                       | 43    | 15    | 31  | 9   | 29  | 1   | 2   | 0                             | 111 | 5  | 0      | 14  | 0 |
| <i>Amaranthus albus</i> L.                                     | Amar   | ah       | NAm                              | 129        | 28 480 332                    | 116      | 13      | 35                                      | 0     | 18    | 0   | 25  | 0   | 47  | 4   | 0                             | 4   | 17 | 22     | 86  | 0 |
| <i>Triticum aestivum</i> L.                                    | Poac   | ag bg    | cult                             | 129        | 30 166 543                    | 104      | 25      | 10                                      | 11    | 1     | 1   | 29  | 7   | 61  | 9   | 0                             | 33  | 16 | 6      | 73  | 1 |
| <i>Acanthospermum hispidum</i> DC.                             | Comp   | ah ph    | SAm                              | 128        | 28 528 196                    | 114      | 14      | 0                                       | 49    | 4     | 33  | 23  | 9   | 9   | 1   | 0                             | 101 | 14 | 2      | 11  | 0 |
| <i>Brassica napus</i> L.                                       | Bras   | ah bh    | Eur                              | 128        | 25 939 661                    | 99       | 29      | 19                                      | 7     | 4     | 0   | 20  | 1   | 63  | 12  | 2                             | 15  | 10 | 19     | 82  | 2 |
| <i>Fagopyrum esculentum</i> Moench                             | Poly   | ah       | As-tm                            | 128        | 35 579 602                    | 113      | 15      | 12                                      | 10    | 36    | 2   | 10  | 0   | 58  | 0   | 0                             | 18  | 5  | 4      | 101 | 0 |
| <i>Acacia farnesiana</i> (L.) Willd.                           | Legu   | s t      | NAm SAM                          | 127        | 26 267 253                    | 91       | 36      | 2                                       | 21    | 10    | 38  | 31  | 18  | 4   | 3   | 0                             | 89  | 15 | 10     | 13  | 0 |
| <i>Arrhenatherum elatius</i> (L.) P. Beauv. ex J. et C. Presl. | Poac   | pg       | Eur Afr As-tm                    | 127        | 25 050 806                    | 113      | 14      | 10                                      | 2     | 36    | 1   | 9   | 2   | 49  | 16  | 2                             | 14  | 3  | 7      | 101 | 2 |
| <i>Sisymbrium irio</i> L.                                      | Bras   | ah       | Eur Afr As-tm<br>As-tr           | 127        | 22 797 687                    | 117      | 10      | 8                                       | 13    | 4     | 1   | 47  | 1   | 20  | 33  | 0                             | 36  | 36 | 17     | 37  | 1 |
| <i>Veronica arvensis</i> L.                                    | Plan   | ah       | Eur Afr As-tm<br>As-tr           | 127        | 23 817 742                    | 105      | 22      | 0                                       | 5     | 11    | 3   | 28  | 3   | 60  | 17  | 0                             | 24  | 11 | 12     | 78  | 2 |
| <i>Alternanthera sessilis</i> (L.) R. Br. ex DC.               | Amar   | ah ph    | As-tm As-tr Aus                  | 126        | 27 639 448                    | 78       | 48      | 1                                       | 66    | 13    | 7   | 7   | 31  | 0   | 1   | 0                             | 102 | 10 | 1      | 13  | 0 |
| <i>Chloris virgata</i> Sw.                                     | Poac   | ag pg    | Afr As-tm As-tr<br>NAm SAM       | 126        | 21 326 438                    | 101      | 25      | 1                                       | 3     | 22    | 1   | 48  | 15  | 30  | 6   | 0                             | 43  | 25 | 9      | 49  | 0 |
| <i>Datura innoxia</i> Mill.                                    | Sola   | ah       | NAm SAM                          | 126        | 31 081 289                    | 114      | 12      | 11                                      | 29    | 11    | 32  | 34  | 0   | 0   | 9   | 0                             | 68  | 28 | 18     | 12  | 0 |
| <i>Melilotus officinalis</i> (L.) Pall.                        | Legu   | ah bh ph | Eur As-tm As-tr                  | 126        | 36 062 914                    | 106      | 20      | 13                                      | 7     | 17    | 1   | 11  | 0   | 68  | 8   | 1                             | 10  | 9  | 9      | 95  | 3 |
| <i>Panicum miliaceum</i> L.                                    | Poac   | ag       | As-tm                            | 126        | 23 822 914                    | 106      | 20      | 15                                      | 6     | 3     | 2   | 26  | 4   | 55  | 15  | 0                             | 36  | 8  | 12     | 70  | 0 |
| <i>Thlaspi arvense</i> L.                                      | Bras   | ah       | Eur As-tm As-tr                  | 126        | 37 145 363                    | 111      | 15      | 8                                       | 8     | 30    | 1   | 4   | 0   | 68  | 7   | 0                             | 11  | 4  | 3      | 106 | 2 |
| <i>Trifolium campestre</i> Schreb.                             | Legu   | ah bh    | Eur Afr As-tm                    | 126        | 22 853 579                    | 110      | 16      | 1                                       | 7     | 5     | 2   | 37  | 1   | 55  | 18  | 0                             | 23  | 13 | 22     | 67  | 1 |
| <i>Brassica oleracea</i> L.                                    | Bras   | ph       | Eur                              | 125        | 28 899 405                    | 79       | 46      | 5                                       | 11    | 32    | 1   | 15  | 23  | 31  | 6   | 1                             | 35  | 11 | 8      | 70  | 1 |
| <i>Chloris gayana</i> Kunth                                    | Poac   | pg       | Eur Afr                          | 125        | 17 191 262                    | 104      | 21      | 1                                       | 12    | 9     | 3   | 50  | 9   | 33  | 8   | 0                             | 65  | 31 | 8      | 21  | 0 |
| <i>Emilia sonchifolia</i> (L.) DC. ex DC.                      | Comp   | ah       | As-tm As-tr                      | 125        | 15 073 463                    | 68       | 57      | 0                                       | 12    | 12    | 32  | 13  | 34  | 9   | 13  | 0                             | 101 | 4  | 1      | 19  | 0 |
| <i>Saponaria officinalis</i> L.                                | Cary   | ph       | Eur As-tm                        | 125        | 27 645 220                    | 110      | 15      | 14                                      | 4     | 11    | 0   | 10  | 0   | 59  | 27  | 0                             | 14  | 6  | 12     | 93  | 0 |
| <i>Tanacetum parthenium</i> (L.) Sch. Bip.                     | Comp   | ph       | Eur As-tm                        | 125        | 22 852 795                    | 106      | 19      | 25                                      | 8     | 2     | 0   | 11  | 0   | 42  | 37  | 0                             | 17  | 10 | 22     | 75  | 1 |

Table 4. – The most widely distributed naturalized plant species by zonobiomes (see text for description). Ten species with the highest frequency of occurrence in each biome (expressed as the percentage of the total, n) are shown.

| I, II Tropical (n = 447)  |                                      | V–VIII Temperate (n = 214) |                                  |
|---------------------------|--------------------------------------|----------------------------|----------------------------------|
| 49.2                      | <i>Euphorbia hirta</i>               | 68.2                       | <i>Erigeron canadensis</i>       |
| 49.0                      | <i>Ricinus communis</i>              | 64.0                       | <i>Lolium perenne</i>            |
| 43.6                      | <i>Sonchus oleraceus</i>             | 62.1                       | <i>Chenopodium album</i>         |
| 41.8                      | <i>Leucaena leucocephala</i>         | 60.7                       | <i>Capsella bursa-pastoris</i>   |
| 41.6                      | <i>Bidens pilosa</i>                 | 60.3                       | <i>Stellaria media</i>           |
| 40.7                      | <i>Eleusine indica</i>               | 59.8                       | <i>Brassica rapa</i>             |
| 39.1                      | <i>Catharanthus roseus</i>           | 57.9                       | <i>Datura stramonium</i>         |
| 38.3                      | <i>Carica papaya</i>                 | 57.9                       | <i>Echinochloa crus-galli</i>    |
| 37.8                      | <i>Euphorbia prostrata</i>           | 56.5                       | <i>Amaranthus retroflexus</i>    |
| 37.6                      | <i>Portulaca oleracea</i>            | 56.5                       | <i>Poa annua</i>                 |
| III Subtropical (n = 85)  |                                      | IX Arctic (n = 18)         |                                  |
| 69.4                      | <i>Sonchus oleraceus</i>             | 55.6                       | <i>Alopecurus pratensis</i>      |
| 68.2                      | <i>Chenopodium murale</i>            | 50.0                       | <i>Dactylis glomerata</i>        |
| 63.5                      | <i>Erodium cicutarium</i>            | 50.0                       | <i>Phleum pratense</i>           |
| 55.3                      | <i>Ricinus communis</i>              | 50.0                       | <i>Leucanthemum vulgare</i>      |
| 52.9                      | <i>Medicago polymorpha</i>           | 50.0                       | <i>Deschampsia cespitosa</i>     |
| 49.4                      | <i>Cynodon dactylon</i>              | 44.4                       | <i>Matricaria matricarioides</i> |
| 49.4                      | <i>Chenopodium album</i>             | 38.9                       | <i>Poa annua</i>                 |
| 47.1                      | <i>Cenchrus ciliaris</i>             | 38.9                       | <i>Poa pratensis</i>             |
| 47.1                      | <i>Setaria verticillata</i>          | 38.9                       | <i>Trifolium pratense</i>        |
| 47.1                      | <i>Marrubium vulgare</i>             | 38.9                       | <i>Fallopia convolvulus</i>      |
|                           |                                      | 38.9                       | <i>Lamium amplexicaule</i>       |
|                           |                                      | 38.9                       | <i>Lamium purpureum</i>          |
|                           |                                      | 38.9                       | <i>Anthriscus sylvestris</i>     |
| IV Mediterranean (n = 80) |                                      |                            |                                  |
| 53.8                      | <i>Sonchus oleraceus</i>             |                            |                                  |
| 50.0                      | <i>Anagallis arvensis</i>            |                            |                                  |
| 48.8                      | <i>Erigeron bonariensis</i>          |                            |                                  |
| 48.8                      | <i>Erodium cicutarium</i>            |                            |                                  |
| 47.5                      | <i>Chenopodium album</i>             |                            |                                  |
| 47.5                      | <i>Mesembryanthemum crystallinum</i> |                            |                                  |
| 46.3                      | <i>Medicago sativa</i>               |                            |                                  |
| 42.5                      | <i>Chenopodium murale</i>            |                            |                                  |
| 42.5                      | <i>Melilotus indicus</i>             |                            |                                  |
| 41.3                      | <i>Amaranthus hybridus</i>           |                            |                                  |
| 40.0                      | <i>Centaurea melitensis</i>          |                            |                                  |

Some of those most widespread species belong to the ones most successful in multiple zonobiomes such as *Chenopodium album* in subtropical, mediterranean, and temperate regions, *Sonchus oleraceus* in tropical, subtropical and mediterranean, or *Ricinus communis* and *Bidens pilosa* in both tropical and subtropical regions. Species that are the most widespread in particular zonobiomes are shown in Table 4. One pattern inferred from the comparison of the five zonobiomes is that in temperate and subtropical regions the frequencies that the most widespread taxa reach are the highest, with *Erigeron canadensis*, *Sonchus oleraceus* and *Chenopodium murale* all naturalized in nearly 70%

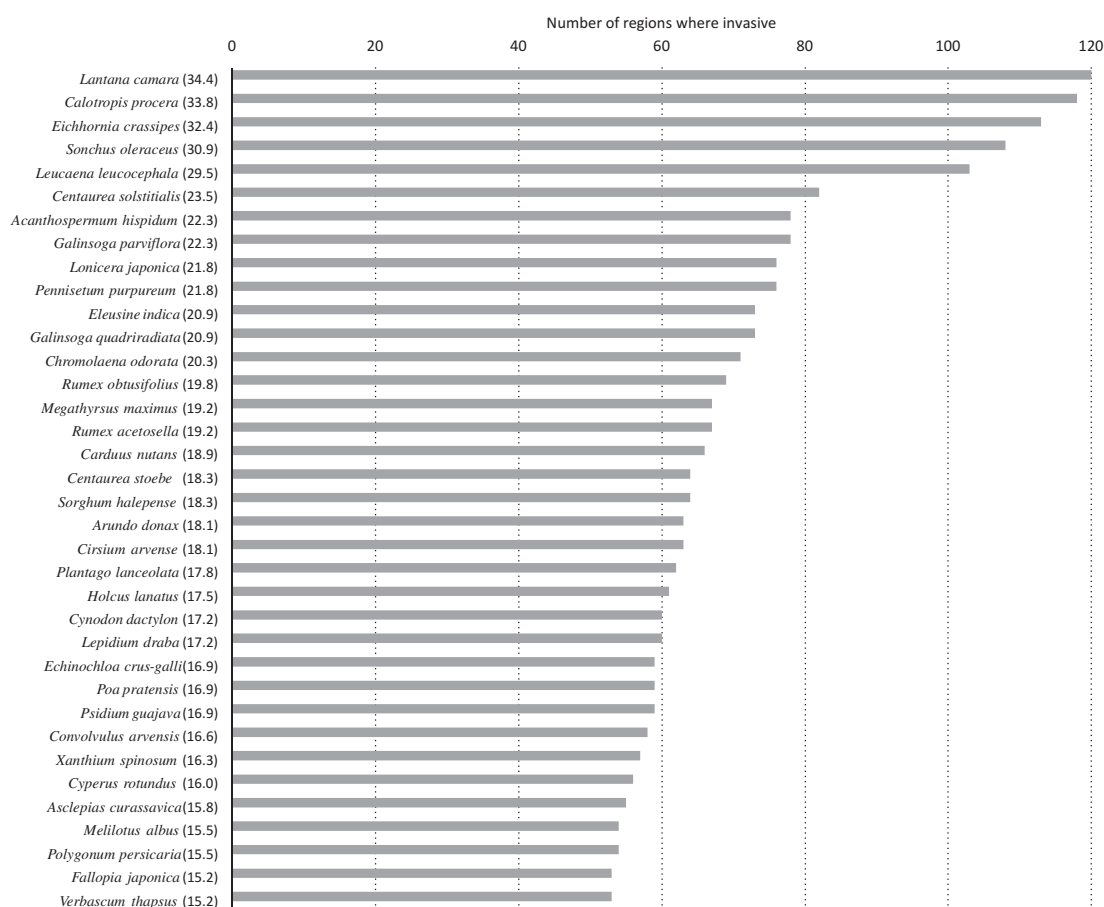


Fig. 7. – Species recorded as invasive in at least 15% of regions for which the data are available ( $n = 349$ ). Percentage of the total number of regions is given in parentheses following the species name.

of regions, and all the top 10 species in the temperate region reach higher percentages than the most widespread species in all other zonobiomes except the subtropical one (Table 4).

Using the occurrence as invasive rather than only naturalized yields a different ranking, with the following species occurring in more than 25% of regions where the data on invasiveness are available ( $n = 349$ ): *Lantana camara* (120 regions), *Calotropis procera* (118), *Eichhornia crassipes* (113), *Sonchus oleraceus* (108) and *Leucaena leucocephala* (103). Overall, there are 36 species reported as invasive from at least 15% of regions (corresponding to 53 regions or more; Fig. 7).

#### *Life history and origin of global naturalized alien flora*

The best represented life histories among the global naturalized flora are perennial forbs, composing more than one third of all taxa (34.4%), with perennial grasses adding another



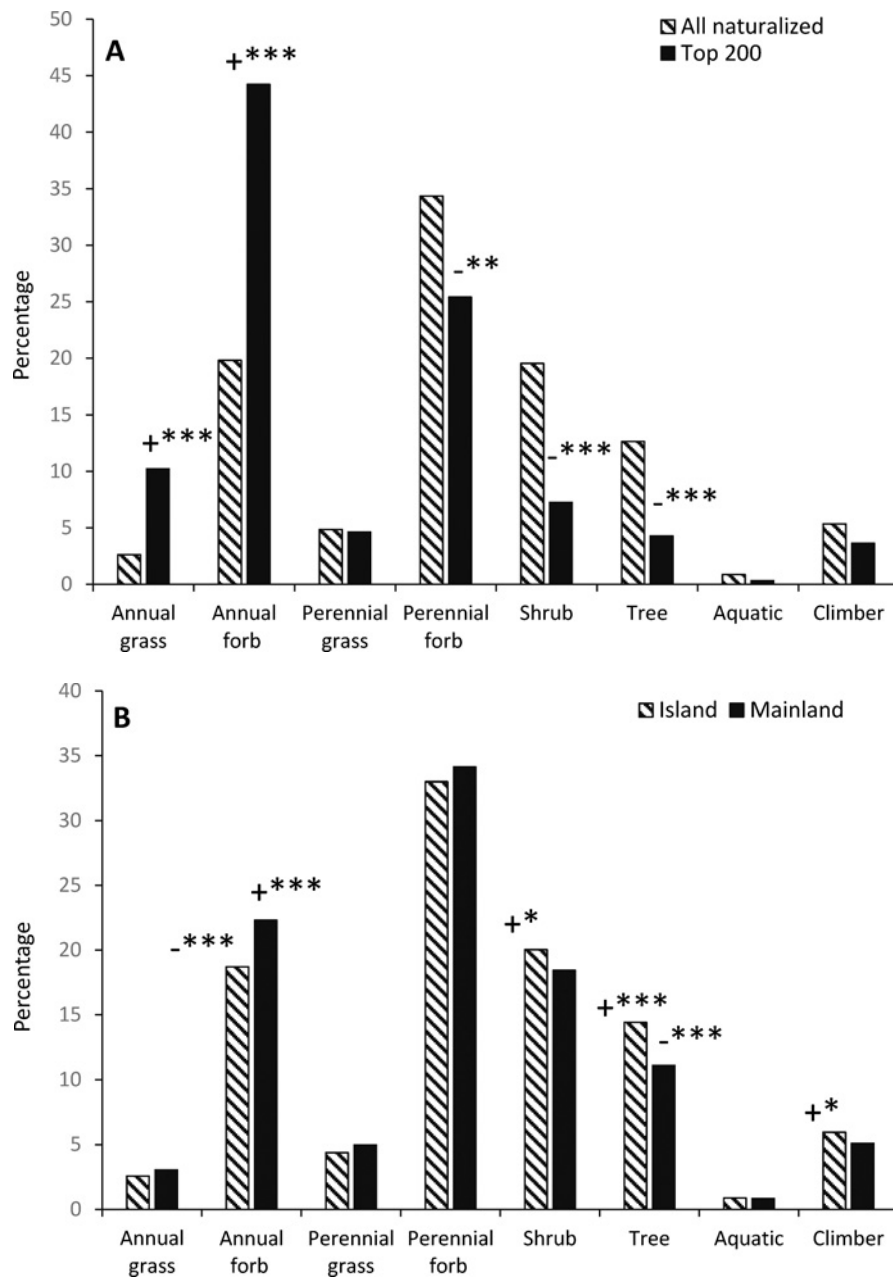


Fig. 8. – Life history spectra for (A) all naturalized aliens with this information available ( $n = 13,164$ ) and the 200 most widely distributed as listed in Table 3, and (B) for all naturalized aliens recorded on islands ( $n = 8019$ ) and in mainland regions ( $n = 10,345$ ). Taxa that occur with more than one life history were counted in each, biennial species were included within perennial life history. The 200 most widely distributed taxa significantly differ from the complete data set ( $\chi^2 = 166.4$ ,  $df = 7$ ,  $P < 0.001$ ), and so do islands from mainland regions ( $\chi^2 = 115.9$ ,  $df = 7$ ,  $P < 0.001$ ). Plus and minus signs indicate a significant over- and under-representation, respectively, at  $P^{***} < 0.001$ ,  $P^{**} < 0.01$  and  $P^* < 0.05$ .

4.8% to the total of 39.2% that are non-woody perennials. Woody plants and annuals make up 32.1% and 22.4%, respectively, of all naturalized taxa (Fig. 8A). Taking into account how widely distributed the species are provides a dramatically different picture; among the top 200 (as listed in Table 3), there is a significantly higher representation of annuals, both forbs (44.2%) and grasses (10.2%). Accordingly, all other life histories except perennial grasses are disproportionally fewer among the most widely distributed naturalized species; woody species drop to about a half from 22.4% of all naturalized species, to 11.6% of the 200 most widespread species, and the differences are statistically significant. The representation of aquatic plants is below 1% for both groups, but that of climbers drops from 5.3% among all naturalized to 3.6% among the top 200 (see Fig. 8A for the statistics). The most widely distributed representatives of particular life histories can be inferred from Table 3.

We also found some less pronounced but significant differences between life history spectra of complete naturalized floras of mainland and island regions. Islands harbour more woody species (34.4%) than mainland regions (29.5%), and fewer annual herbs, with 18.7% on islands compared to 22.3% in mainland regions (Fig. 8B).

The majority of species that have become naturalized in at least one region of the world originate from Asia (32.0%, with temperate contributing 20.3% and tropical 11.7%), North America (17.1%), Europe (15.1%) and Africa (14.3%), with other continents contributing less (South America 12.8%, Australasia 5.5%, Pacific Islands 2.0%); taxa originated in cultivation (1.0%) or by hybridization (0.2%) have a negligible representation (Fig. 9). The contributions of particular continents, however, change markedly if the same frequency distribution is displayed for the 200 most widely distributed species (as listed in Table 3). For this group of highly successful species, measured by the number of GloNAF regions invaded, the contribution of Europe (18.7%), Africa (19.6%) and tropical Asia (15.8%) significantly increases while that of Australasia (1.8%), and North America (9.9%) is markedly lower, suggesting a reduced role of the latter regions, opposite to the former ones, in donating high numbers of the world's most successful naturalized aliens (Fig. 9).

#### *Higher taxonomic levels and phylogenetic patterns*

Ranking families by their absolute number of naturalized species reveals that those that are generally richest in species also contribute most to the global naturalized alien flora, i.e. *Compositae* (1343 taxa; 10.2% of the total recorded in GloNAF), *Poaceae* (1267; 9.8%) and *Leguminosae* (1189; 9.0%); none of the other families exceed 600 naturalized species globally (Table 5). *Orchidaceae*, the most species-rich family, however, is heavily under-represented with only 73 naturalized alien species (Fig. 10).

As for species, and bearing in mind that the ratio of the total number of naturalized species in mainland and island regions is approximately 3:2 (Table 1), some families are disproportionally represented on islands, including *Arecaceae*, *Araceae*, *Acanthaceae*, *Amaryllidaceae*, *Asparagaceae*, *Convolvulaceae*, *Rubiaceae* and *Malvaceae*. In contrast, fewer families appear to contain disproportionally more naturalized alien species in mainland than island regions, and even in those cases, this imbalance is less profound, e.g. *Brassicaceae*, *Caryophyllaceae* and *Boraginaceae*. Families that are not only rich in naturalized species but also fairly widespread (i.e. representatives are recorded in many

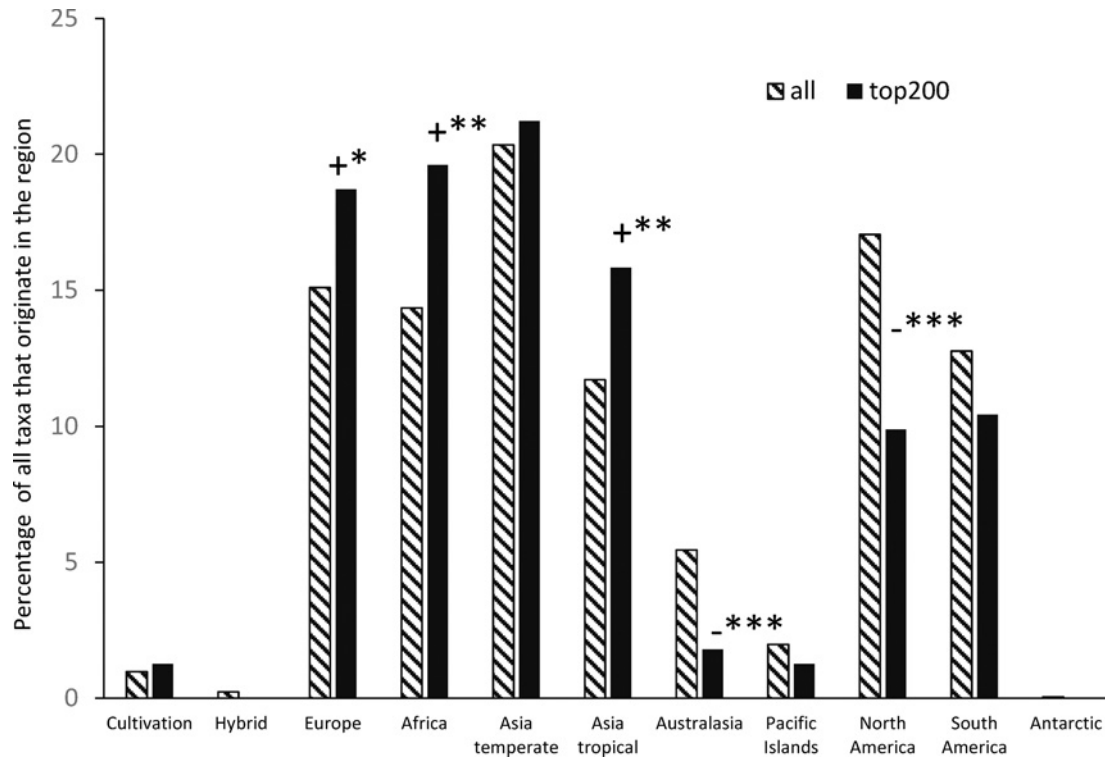


Fig. 9. – Origins of the 200 most widespread species representing the donor regions (TDWG continents) for the world's most widely distributed naturalized plants, compared with the frequency distribution of native regions of all taxa where this information was available ( $n = 13,164$ ). Taxa with native ranges spanning over multiple TDWG regions were considered in each. The 200 most widely distributed taxa significantly differ from the complete data set ( $\chi^2 = 65.9$ ,  $df = 10$ ,  $P < 0.001$ ); the plus and minus signs indicate a significant over- and under-representation, respectively, at  $P^{***} < 0.001$ ,  $P^{**} < 0.01$  and  $P^* < 0.05$ .

regions) include the *Brassicaceae*, *Amaranthaceae*, *Solanaceae*, *Caryophyllaceae* and *Euphorbiaceae*, while the opposite holds true for *Cyperaceae*, *Rosaceae* and *Iridaceae* (Table 5).

However, the absolute naturalized species richness of a family does not inform us about its naturalization success, unless it is related to the total number of species within the family (Fig. 10). In relative terms, some of the large species-rich families are over-represented among naturalized aliens (e.g. *Poaceae*, *Leguminosae*, *Rosaceae*, *Amaranthaceae*, *Pinaceae*), whereas some are under-represented (e.g. *Euphorbiaceae*, *Rubiaceae*, *Orchidaceae*), and the family with the highest number of naturalized alien species, the *Compositae*, is proportional to its global species richness (Fig. 10). Taking into account the position within the phylogenetic tree of vascular plants (Fig. 11), there is, based on a randomization test, a significant phylogenetic signal ( $P = 0.0341$ ). This indicates that certain clades of closely related families have a more similar proportion of species naturalized than expected by chance.

Table 5. – Families that are most represented in the global naturalized alien flora. The top 30 families, ranked by the total number of naturalized species, are shown. The number of species-by-region records is given as a quantitative indication of how widespread the naturalized species of a given family are (a proxy for its 'global abundance'). The total worldwide number of species in the family is taken from The Plant List (version 1.1; <http://www.theplantlist.org>).

| Family                 | Total number of naturalized species | Number of species × region records | Number of naturalized species on mainland | Number of naturalized species on islands | Number of species in the family |
|------------------------|-------------------------------------|------------------------------------|-------------------------------------------|------------------------------------------|---------------------------------|
| <i>Compositae</i>      | 1343                                | 20,972                             | 1133                                      | 710                                      | 36,701                          |
| <i>Poaceae</i>         | 1267                                | 24,328                             | 1078                                      | 737                                      | 11,883                          |
| <i>Leguminosae</i>     | 1189                                | 16,883                             | 929                                       | 728                                      | 26,832                          |
| <i>Rosaceae</i>        | 548                                 | 4978                               | 441                                       | 317                                      | 5325                            |
| <i>Lamiaceae</i>       | 356                                 | 4872                               | 288                                       | 227                                      | 8602                            |
| <i>Cyperaceae</i>      | 331                                 | 2341                               | 246                                       | 185                                      | 6265                            |
| <i>Brassicaceae</i>    | 311                                 | 8083                               | 283                                       | 161                                      | 4507                            |
| <i>Malvaceae</i>       | 258                                 | 4390                               | 190                                       | 178                                      | 4652                            |
| <i>Amaranthaceae</i>   | 251                                 | 6562                               | 227                                       | 140                                      | 2212                            |
| <i>Solanaceae</i>      | 235                                 | 4981                               | 200                                       | 156                                      | 2768                            |
| <i>Plantaginaceae</i>  | 229                                 | 3452                               | 187                                       | 140                                      | 1848                            |
| <i>Caryophyllaceae</i> | 217                                 | 4404                               | 200                                       | 110                                      | 2866                            |
| <i>Euphorbiaceae</i>   | 204                                 | 4245                               | 168                                       | 125                                      | 6835                            |
| <i>Boraginaceae</i>    | 200                                 | 2365                               | 174                                       | 95                                       | 2976                            |
| <i>Polygonaceae</i>    | 186                                 | 3398                               | 160                                       | 115                                      | 1584                            |
| <i>Iridaceae</i>       | 178                                 | 1312                               | 140                                       | 116                                      | 2456                            |
| <i>Rubiaceae</i>       | 176                                 | 1786                               | 124                                       | 115                                      | 14,269                          |
| <i>Onagraceae</i>      | 171                                 | 1545                               | 142                                       | 88                                       | 990                             |
| <i>Apiaceae</i>        | 170                                 | 2658                               | 150                                       | 95                                       | 3509                            |
| <i>Myrtaceae</i>       | 156                                 | 1309                               | 113                                       | 114                                      | 6141                            |
| <i>Convolvulaceae</i>  | 153                                 | 2575                               | 119                                       | 111                                      | 1409                            |
| <i>Ranunculaceae</i>   | 148                                 | 1321                               | 127                                       | 74                                       | 2769                            |
| <i>Asparagaceae</i>    | 147                                 | 1609                               | 108                                       | 107                                      | 3093                            |
| <i>Amaryllidaceae</i>  | 142                                 | 1413                               | 101                                       | 103                                      | 2375                            |
| <i>Acanthaceae</i>     | 130                                 | 1066                               | 81                                        | 95                                       | 4021                            |
| <i>Arecaceae</i>       | 125                                 | 567                                | 42                                        | 115                                      | 2625                            |
| <i>Araceae</i>         | 119                                 | 1102                               | 65                                        | 93                                       | 3459                            |
| <i>Crassulaceae</i>    | 118                                 | 1058                               | 86                                        | 82                                       | 1671                            |
| <i>Apocynaceae</i>     | 115                                 | 1917                               | 78                                        | 71                                       | 5745                            |
| <i>Cactaceae</i>       | 97                                  | 964                                | 78                                        | 54                                       | 2715                            |

Plant families with disproportionally high or low representation of naturalized alien species are therefore distributed non-randomly over the phylogeny (Electronic Appendix 3). Among monocots, there are 21 over-represented families, 12 of these are in the Commelinid clade (which has 31 families in total). This includes *Arecaceae*, *Commelinaceae* and *Poaceae*. In the *Alismatales*, five out of 13 families are over-represented. There are also clades with mostly under-represented families, such as the *Pandanales-Dioscoreales* (seven out of eight families), and the *Liliales* (seven out of 10 families). Among Magnoliids, 14 out of 21 families are under-represented and only one (*Saururaceae*) is over-represented. For Rosids, within the Eurosid-I clade (the *Fabales-Rosales-Fagales* branch), 10 out of 28 families are over-represented. For the rest of the Eurosid-I clade, there are 46 families, but only four are over-represented

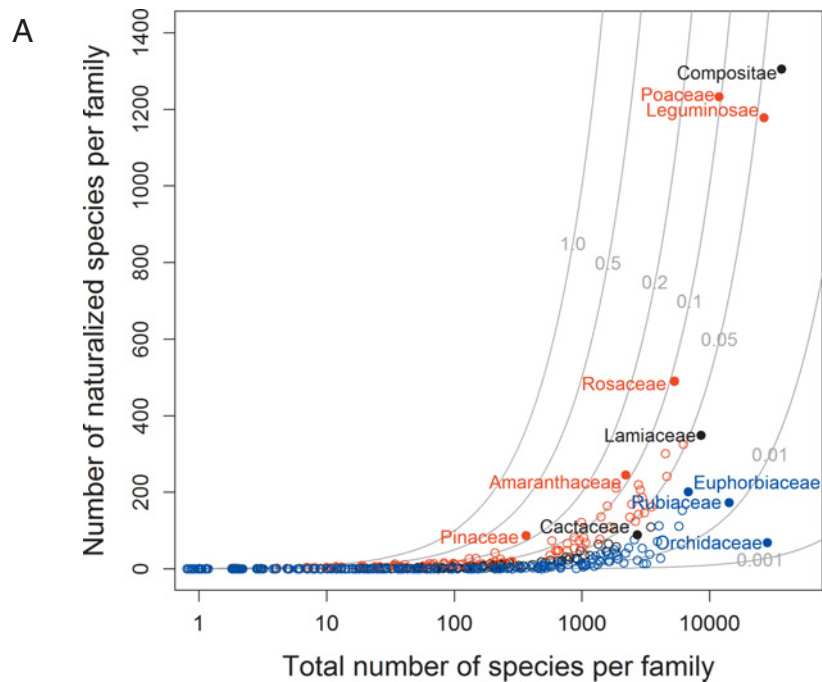


Fig. 10. – Families that are over- and under-represented by naturalized alien species among the global vascular flora. Number of naturalized species per family vs the total number of species per family (on a  $\log_{10}$  scale). Grey isoclines indicate the proportion of species in a family that has become naturalized somewhere in the world. Red dots are over-represented families and blue dots are under-represented families. Black dots are families that fall within the range of expected values. The names of a selective number of families are given in the plot.

(*Oxalidaceae*, *Elatinaceae*, *Hypericaceae*, *Salicaceae*), while 33 are under-represented, and nine are as expected. For Eurosud II (malvids), there are 57 families, but only six are over-represented (*Geraniaceae*, *Onagraceae*, *Lythraceae*, *Melanthaceae*, *Malvaceae*, and *Resedaceae*).

*Solanum* (112 species), *Euphorbia* (108) and *Carex* (106) are the only three genera with more than 100 naturalized species (Table 6). The genera with obvious over-representation on islands are *Cotoneaster*, *Juncus*, *Eucalyptus*, *Salix*, *Hypericum*, *Geranium* and *Persicaria*, while those relatively richer in naturalized species in mainland regions are *Atriplex*, *Opuntia*, *Oenothera*, *Artemisia*, *Vicia*, *Galium* and *Rosa*. Using the ranking according to the species  $\times$  region measure, *Amaranthus*, *Bromus*, *Lepidium*, *Chenopodium*, *Medicago* and *Senna* are genera with higher positions than that based on the number of species alone, while *Carex* is an example of a genus whose numerous representatives only have rather limited distributions as naturalized species (Table 6).

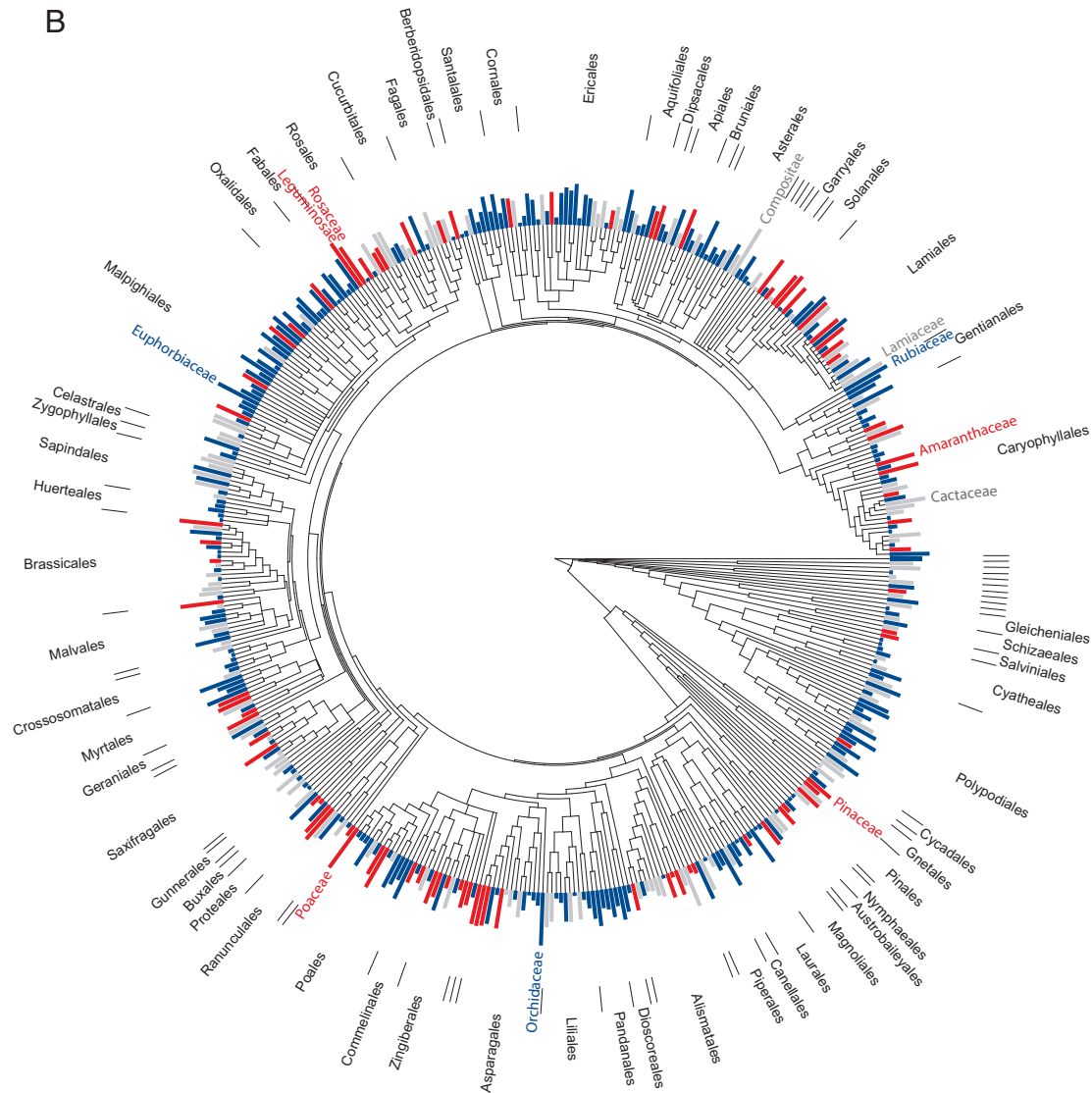


Fig. 11. – Families that are over- and under-represented by naturalized alien species among the global vascular flora. Phylogenetic tree of all vascular plant families. The sizes of the bars are proportional to the natural log of the number of species in a family. Red and blue bars and family names correspond to families that are significantly over-represented and under-represented, respectively, grey bars and black names indicate no significant difference. The phylogenetic signal is significant at  $P = 0.0341$  (see text for explanation). Only families displayed in Fig. 10 are indicated by name, together with clades; for a complete tree with all family names see Electronic Appendix 3.

Table 6. – Genera that are most represented in global naturalized floras. The top 50 genera, ranked by the total number of naturalized species, are shown. The number of species-by-region records is given as a quantitative indication of how widespread the species of a given genus are (a proxy for the genus' 'global abundance'). The total worldwide number of species in the family is taken from The Plant List (version 1.1; <http://www.theplantlist.org>).

| Genus              | Total number of naturalized species | Number of species × region records | Number of naturalized species on mainland | Number of naturalized species on islands | Number of species in the genus |
|--------------------|-------------------------------------|------------------------------------|-------------------------------------------|------------------------------------------|--------------------------------|
| <i>Solanum</i>     | 112                                 | 1859                               | 93                                        | 74                                       | 1230                           |
| <i>Euphorbia</i>   | 108                                 | 2694                               | 90                                        | 69                                       | 2160                           |
| <i>Carex</i>       | 106                                 | 366                                | 79                                        | 57                                       | 2289                           |
| <i>Oenothera</i>   | 89                                  | 880                                | 80                                        | 40                                       | 207                            |
| <i>Rubus</i>       | 84                                  | 577                                | 67                                        | 48                                       | 1568                           |
| <i>Acacia</i>      | 80                                  | 770                                | 62                                        | 50                                       | 1495                           |
| <i>Cotoneaster</i> | 80                                  | 404                                | 43                                        | 68                                       | 294                            |
| <i>Cyperus</i>     | 79                                  | 1171                               | 63                                        | 50                                       | 748                            |
| <i>Eucalyptus</i>  | 78                                  | 436                                | 55                                        | 56                                       | 859                            |
| <i>Trifolium</i>   | 70                                  | 1848                               | 65                                        | 43                                       | 339                            |
| <i>Juncus</i>      | 66                                  | 550                                | 49                                        | 48                                       | 393                            |
| <i>Rumex</i>       | 63                                  | 1253                               | 55                                        | 34                                       | 183                            |
| <i>Rosa</i>        | 56                                  | 671                                | 51                                        | 28                                       | 435                            |
| <i>Eragrostis</i>  | 55                                  | 1239                               | 49                                        | 30                                       | 427                            |
| <i>Ipomoea</i>     | 55                                  | 1384                               | 47                                        | 42                                       | 468                            |
| <i>Crotalaria</i>  | 52                                  | 761                                | 39                                        | 33                                       | 757                            |
| <i>Silene</i>      | 52                                  | 939                                | 46                                        | 30                                       | 558                            |
| <i>Pinus</i>       | 50                                  | 494                                | 41                                        | 34                                       | 175                            |
| <i>Salix</i>       | 50                                  | 732                                | 38                                        | 38                                       | 627                            |
| <i>Veronica</i>    | 50                                  | 1155                               | 45                                        | 33                                       | 234                            |
| <i>Hypericum</i>   | 49                                  | 283                                | 34                                        | 32                                       | 524                            |
| <i>Artemisia</i>   | 48                                  | 703                                | 43                                        | 22                                       | 530                            |
| <i>Geranium</i>    | 48                                  | 598                                | 36                                        | 34                                       | 428                            |
| <i>Senecio</i>     | 47                                  | 509                                | 35                                        | 29                                       | 1666                           |
| <i>Atriplex</i>    | 46                                  | 583                                | 43                                        | 17                                       | 305                            |
| <i>Oxalis</i>      | 46                                  | 905                                | 37                                        | 30                                       | 545                            |
| <i>Plantago</i>    | 46                                  | 836                                | 40                                        | 25                                       | 185                            |
| <i>Potentilla</i>  | 46                                  | 380                                | 38                                        | 23                                       | 381                            |
| <i>Ranunculus</i>  | 45                                  | 589                                | 37                                        | 25                                       | 484                            |
| <i>Chenopodium</i> | 44                                  | 1152                               | 40                                        | 26                                       | 164                            |
| <i>Paspalum</i>    | 44                                  | 714                                | 35                                        | 29                                       | 329                            |
| <i>Persicaria</i>  | 44                                  | 684                                | 37                                        | 35                                       | 71                             |
| <i>Salvia</i>      | 44                                  | 563                                | 36                                        | 28                                       | 1037                           |
| <i>Taraxacum</i>   | 44                                  | 375                                | 28                                        | 21                                       | 2336                           |
| <i>Prunus</i>      | 43                                  | 688                                | 38                                        | 23                                       | 286                            |
| <i>Passiflora</i>  | 42                                  | 549                                | 32                                        | 28                                       | 534                            |
| <i>Vicia</i>       | 42                                  | 914                                | 42                                        | 23                                       | 289                            |
| <i>Bromus</i>      | 41                                  | 1385                               | 38                                        | 31                                       | 181                            |
| <i>Allium</i>      | 40                                  | 419                                | 35                                        | 22                                       | 972                            |
| <i>Amaranthus</i>  | 40                                  | 1987                               | 38                                        | 29                                       | 113                            |
| <i>Panicum</i>     | 40                                  | 624                                | 35                                        | 21                                       | 442                            |
| <i>Sedum</i>       | 40                                  | 426                                | 32                                        | 28                                       | 421                            |
| <i>Senna</i>       | 40                                  | 1096                               | 34                                        | 28                                       | 351                            |
| <i>Lepidium</i>    | 39                                  | 1228                               | 37                                        | 20                                       | 253                            |
| <i>Centaurea</i>   | 38                                  | 790                                | 34                                        | 21                                       | 922                            |
| <i>Opuntia</i>     | 38                                  | 586                                | 36                                        | 15                                       | 226                            |
| <i>Ficus</i>       | 37                                  | 346                                | 23                                        | 25                                       | 911                            |
| <i>Medicago</i>    | 37                                  | 1099                               | 30                                        | 24                                       | 122                            |
| <i>Galium</i>      | 35                                  | 443                                | 31                                        | 17                                       | 733                            |
| <i>Iris</i>        | 35                                  | 379                                | 31                                        | 18                                       | 389                            |



## Discussion

### *Total numbers of naturalized species and transition rates along the invasion process*

A previous analysis based on the GloNAF data (van Kleunen et al. 2015) revealed that over 13,000 plant species have become naturalized somewhere on the globe, and identified Europe and North America as the continents with the highest numbers of naturalized alien plants. The study also showed that the traditional global dichotomy of the Old World donating and the New World receiving naturalized plants needs to be reconsidered; rather, the Northern Hemisphere is a major donor of naturalized plants to other parts of the world. These results demonstrated, for the first time at the scale of the whole world, that naturalization processes exhibit clear biogeographic patterns (van Kleunen et al. 2015). In the present paper we found a marginally significantly faster rate of naturalized species accumulation with region area for the New World than for the Old World (see Lonsdale 1999). Nevertheless, this does not contradict the previous finding because a fast rate of species accumulation refers to certain aspects of the regional invasibility (see Pyšek & Jarošík 2005), but reflects neither the species compositions of naturalized floras in the regions analysed (as the relationship we tested was based on species numbers), nor the historical flows of naturalized species among continents as in van Kleunen et al. (2015).

The total number of 13,168 naturalized alien species reported by van Kleunen et al. (2015) means that at least 4% of all currently known vascular plant species on Earth ( $n = 337,137$ ; The Plant List 2015) have become naturalized outside their natural ranges because of humans. The well-known Tens Rule (Williamson & Fitter 1996, Jeschke et al. 2012), according to which ~10% of the vascular plant species would appear as casuals in the wild, and ~10% of those would naturalize, predicts a global estimate of only 3,371 naturalized plant species, i.e. a large underestimate of the global naturalized alien flora. Even taking into account the more liberal range of proportions of casuals and naturalizations proposed under the Tens Rule (5–20%; Williamson & Fitter 1996), the actual total number of naturalized plant species globally is at the upper limit of the prediction ( $337,137 \times 0.2 \times 0.2 = 13,485$  naturalized plant species; also see Richardson & Pyšek 2006).

Our study also provides some indication of how the next transition in the invasion process, following after the species have reached the naturalization stage, fits the prediction of the Tens Rule, one of the early concepts in invasion ecology to which real data are often compared (e.g. Richardson & Pyšek 2006, Jeschke et al. 2012). After reaching the naturalization stage, the Tens Rule predicts that ~10% species would become pests, i.e. have an impact. Since our definition of invasive species is based on impact (CBD 2000, IUCN 2000) rather than spread (Richardson et al. 2000), it may be considered as roughly corresponding to the pest category used by the original Tens Rule concept (Williamson & Fitter 1996). Interestingly, the rate at which naturalized species numbers increase with area for mainland regions closely corresponds to that predicted by the Tens Rule, while on islands the observed increase is slower than predicted (Fig. 4). Nevertheless, it needs to be kept in mind that the Tens Rule was formulated based on observations of a limited number of data sets and there is no theoretical basis for why exactly 10% of species should reach the next stage of invasion.

*Most widespread naturalized alien species*

Our data provide the first robust estimate of how widespread the most successful naturalized species are over a very large area of the globe. There are some historical data to compare the most widespread naturalized species with, a remarkable one being a study by Coquillat (1951) resulting from a questionnaire asking several botanists at that time to make lists of the plant species that were globally most widespread based on their expertise. The majority of species identified by this survey were common ruderal taxa of European origin, that were widespread over the globe already in the mid-20th century and therefore many of them are also in the GloNAF top-200 list (Table 2), e.g. *Sonchus oleraceus*, *Capsella bursa-pastoris*, *Chenopodium album*, *Plantago major* and *Poa annua*. The absence from the list of Coquillat (1951) of some presently very widespread aliens with an origin in regions outside Europe (e.g. *Ricinus communis*, *Eleusine indica*, *Mirabilis jalapa*) may be due to geographical expertise of researchers approached for Coquillat's study, or because these species have spread particularly rapidly during the last decades.

There is a markedly greater representation of annuals and disproportionately fewer shrubs and trees amongst the most widespread naturalized aliens. This can be related to a greater dispersal ability and rates of spread of annuals that are related to their broader overall distribution (Forcella 1985, Pyšek & Hulme 2005). Annuals might also be less limited by climate, such as cold winters and drought periods, as they can finish their short life cycle in a few months. The short generation time and some typical traits such as ability to form seed banks (Gioria et al. 2012, Gioria & Pyšek 2016, Milakovic & Karrer 2016), together with their affinity to anthropogenic habitats where they easily colonize and establish, likely contribute to the faster spread of annuals compared with woody perennials (Berg et al. 2016). The lag times for trees and shrubs following introduction to a new region are on the scales of decades to centuries (Kowarik 1995). Another factor contributing to this pattern is that the introduction pathway for annuals is often crop contamination as weeds (e.g. Wilson et al. 2016), that then proliferate in regions where naturalized owing to human disturbance through agriculture.

*Naturalized and invasive species*

It needs to be borne in mind that compared to the classification of species as 'naturalized', labelling a species as 'invasive' often needs to be taken with caution because the criteria for the latter are less distinct (Catford et al. 2016). The main criterion for classifying a species as naturalized, i.e. the fact that it reproduces in the wild and forms self-sustaining populations (Richardson et al. 2000, Blackburn et al. 2011), is a qualitative one, and more or less binary (the species is either naturalized or not), hence it is easier to apply and some studies even distinguish between casual and naturalized populations of the same species (Essl et al. 2009). However, the criteria for considering a species invasive differ even between ecologists on one side and conservationists, managers and policy makers on the other (CBD 2000, IUCN 2000). The ecological criteria for invasiveness based on the rate of spread are quantitative, representing rather a continuum (Richardson & Pyšek 2006), and this trait is extremely difficult to measure (Pyšek & Hulme 2005). Therefore the likelihood that the species that behaves the same in two regions will be categorized differently by different researchers is greater for invasive than for naturalized status.

In this paper, we used the IUCN (2000) definition of invasiveness, which is related to species' impacts rather than the purely ecological one based on spread (Richardson et al. 2000, Blackburn et al. 2011). The reason for this decision was to increase comparability of the data from different regions. The IUCN definition is reflected in a major database of the most problematic invasive species, the ISSG Global Invasive Species Database (Pagad et al. 2016), for which the data are standardized. Unfortunately, no systematic standardization of the term 'invasive' based on the latter ecological definition exists for global regions, therefore the reasons for designating species as invasive vary regionally. Evaluation of alien species in terms of their regional invasiveness is not included even in some authoritative continental databases such as DAISIE (2009) or BONAP (Kartesz 2015). The data we provide here therefore represent the most comprehensive published account of regional richness of invasive species to date (Appendix 1) with impact on semi(natural) communities, and may serve as a baseline and stimulus for elaborating a global picture of invasiveness based on ecological criteria such as the dynamics of spread (Richardson et al. 2000).

We found a strong correlation between the numbers of invasive (sensu CBD 2000, IUCN 2000) and all naturalized taxa (sensu Richardson et al. 2000, Blackburn et al. 2011), which is an important message from the prediction point of view. This means that the regions labelled as invasion hotspots correspond to those identified as regions with the greatest occurrence of naturalized species. This has been previously reported by Rejmánek & Randall (2004) who showed that the number of naturalized species in US states is a reliable predictor of the number of species considered as pests, and by Chytrý et al. (2009a) for Europe where regions with many alien species also had more invasive species. The evidence we present here suggests that the relationship is generally valid globally, and can have important implications for management, because even without having good information on the number of invasive species, areas with many naturalized aliens can be identified as having a high risk of being invaded. On the other hand, the importance of data quality issues cannot be underestimated because using naturalized alien species as an indicator of invasiveness in regions where they are poorly recorded might result in underestimating the invasion risk.

#### *Differences in the composition of naturalized floras between mainland and island regions*

In the present paper we provide the most robust evidence so far that some plant families have disproportionally high or low representation of naturalized species, and that such families are distributed non-randomly over the phylogeny; previous research from the late 1990s reported a high concentration of 'invasive families' in subclasses such as *Commelinidae*, *Alismatidae* (Daehler 1998), *Caryophyllidae* and *Asteridae* (Pyšek 1998). The fact that some families are over-represented on islands and others in mainland regions can possibly be related to their evolutionary centres of diversity. The representatives of the former group, such as *Arecaceae*, *Araceae*, *Acanthaceae*, *Amaryllidaceae*, *Asparagaceae*, *Convolvulaceae* or *Rubiaceae*, have their centres of diversity in the tropics (Mabberley 2008), and many of the islands in our data sets are tropical or subtropical. This might serve as an explanation for the differences between islands and mainland regions at the higher taxonomic levels, and is further supported by the fact that fewer families appear to contain disproportionally more naturalized alien species in mainland than

island regions, and those that do, are large families with centres of diversity in temperate regions, such as *Brassicaceae*, *Caryophyllaceae* and *Boraginaceae* (Mabberley 2008). Regarding species that are over-represented in one of the region types, there is an interesting dichotomy. Many of the mainly mainland species are agricultural weeds that have been mostly introduced accidentally while many species over-represented on islands are woody, edible fruit-producing taxa, or with some other amenity value, i.e. deliberately introduced.

Another striking difference that we found when analysing island and mainland naturalized floras from the life-history perspective was that islands harbour 17% more woody species (they contribute 34% on islands but below 30% on mainland) and 16% fewer annual forbs (19% and 22%, respectively). This result is in accordance with expected under-representation of native woody plants on islands, related to their low dispersal ability compared to other life forms (König et al. 2017). These authors, in their global analysis of native floras based on 150,000 vascular plant species, showed that the ability to pass ecological filters depends on species attributes such as dispersal ability or environmental tolerance that are reflected by group-specific turnover patterns (defined as the amount of change in species identities among study sites). They reported lowest turnover rates for pteridophytes, intermediate for angiosperms, gymnosperms and herbs, and highest for trees and shrubs (König et al. 2017).

#### *Factors shaping the richness of naturalized floras*

Some of the results presented in this paper confirm previously reported phenomena, such as the greater vulnerability of islands to invasions by naturalized plants (van Kleunen et al. 2015), illustrated here by the number of naturalized species on islands increasing with the number of native species at a faster rate than in mainland regions. However, the opposite is true for the increase of invasive species number with that of naturalized – one explanation may be that because there are so many successfully naturalized species on islands, the sampling effect is less pronounced when it comes to transition towards invasive species. The analysis using regression trees revealed that it is mainly geography that shapes the levels of naturalization on islands, with greater distance to continental landmasses as a proxy for evolutionary isolation resulting in more naturalizations, and greater altitudinal range, representing a greater niche availability, and location in Southern Hemisphere increasing the levels of naturalization on islands that are closer to the mainland.

The same analysis for mainland regions points to biogeography as the main predictor of the levels of naturalization; temperate and mediterranean areas tend to be more invaded, and the pattern is further shaped by socioeconomic factors. Using per-capita GDP as the major socioeconomic factor, correlated with many others (Pyšek et al. 2010), suggests that the level of naturalization only increases with GDP to some threshold after which it is reduced, and that there thus might be an optimum range of socioeconomic influence favouring the presence of naturalized plants. We can speculate that disturbances, an important factor in invasion (Hobbs & Huenneke 1992) cease to support naturalization if they become too severe above a certain threshold, or that the most developed economies allocate more resources to biosecurity, which would be supported by the fact that many of the less invaded regions by naturalized plants that were above the threshold GDP were in Australia.

*The GloNAF database: a key resource for better understanding of global invasions*

As pointed out by Joppa et al. (2016), progress in the implementation of very large and complex biodiversity data sets is essential to prevent the impacts caused by invasive alien species on biodiversity and on human livelihood. Therefore, it is important to improve the mobilization of the available data both for sustainable development and for environmental protection. The outcomes of this study illustrate how the progress in the compilation and evaluation of global data on alien plants can significantly increase our understanding of invasion patterns. Besides providing the first robust estimates of variation in the numbers of naturalized plant species worldwide, the GloNAF database is a unique data source for testing various hypotheses about invasion mechanisms. It has the potential to become one of the key tools for better understanding and predicting plant invasions globally. Compared to some widely used resources on species distributions, such as GBIF (2014), GloNAF allows for more rigorous testing of issues related to invasions because of the thorough evaluation of alien species status during data acquisition and collation (van Kleunen et al. 2015). Yet, an improvement of global data on alien species could be achieved through merging GloNAF information with GBIF, which is the largest data source for point localities of species distributions. So far the majority of GBIF data lack information on species native vs alien status, information present in GloNAF. Conversely, GloNAF could profit from increasing its coverage by using GBIF point data for regions from where there is no systematic record of aliens.

As illustrated by Hulme & Weser (2011), any overview of plant invasion patterns can only be as good as the databases behind it, and depends on the consistent treatment of species status, survey effort and taxonomic coverage. In their comparison of the two major European databases, DAISIE and NOBANIS, these authors found that alien species richness, cross-taxon correlations and the significance of individual drivers of invasion were all strongly database dependent, but the differences were more marked for the total numbers of all aliens than for naturalized aliens. Also, in many cases the major difficulty is not data accessibility but its subsequent integration and standardization (Crall et al. 2006, Hulme & Weser 2011). This points to naturalization as the crucial stage of the invasion process, which should be paid most attention, not only because it is the most rigorously defined of all invasion stages but also because invasive species recruit from naturalized species (Richardson & Pyšek 2012).

It needs to be noted that the GloNAF database analysed here represents the state of the art in a field addressing one of the most dynamic phenomena in ecology. Despite every attempt to track the best data sources (Electronic Appendix 1) and follow the definition of 'naturalized' as rigorously as data allowed, a database comprising ~175,000 taxon-by-region records is bound to vary in data quality and cannot be free of errors. However, the data presented in this paper should be understood as a comprehensive summary pointing also to gaps, how the data can be improved and where they should be primarily collected, reflecting regional differences (see Latombe et al. 2017). One politically relevant and important application of global data sets on alien species is the development of indicators, which is currently under way for alien species as part of the GEOBON network (Latombe et al. 2017). Gathering information on absolute numbers and proportions and if possible on the dynamics of alien species (see Seebens et al. 2017) will form a solid baseline for any indicator development with a temporal perspective.

GloNAF already now can be used for designing concerted action to fill data gaps, and to allocate resources most efficiently towards better understanding and management of plant invasions worldwide. To achieve this aim, we recommend that global data providers work in synergy to improve the standard of the data made available and increase connections among existing databases, to increase knowledge and empower more effective policies at all scales.

See [www.preslia.cz](http://www.preslia.cz) for Electronic Appendices 1–3

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### Souhrn

V článku, založeném na datech z nedávno vytvořené databáze GloNAF (akronym pro Global Naturalized Alien Flora), jež obsahuje informace o rozšíření nepůvodních naturalizovaných druhů rostlin ve 482 pevninských regionech a na 362 ostrovech, jsou popsány globální zákonitosti geografického rozšíření naturalizovaných flór, jejich taxonomické a fylogenetické složení a faktory určující rozdíly v druhové bohatosti mezi pevninou a ostrovy. Mezi pevninské oblasti s největším počtem naturalizovaných druhů patří některé australské státy (především New South Wales) a několik severoamerických (mezi nimiž Kalifornie se 1753 taxony představuje vůbec nejbohatší oblast); Anglie, Japonsko, Nový Zéland a Havajské soustroví představují druhově nejbohatší ostrovní oblasti. Regiony s největším počtem naturalizovaných druhů vesměs tvoří také tzv. ‘hotspots’ světových invazí, vyjádřeno procentuálním podílem těchto druhů na celkové flóře dané oblasti. Najdeme je na západě i východě Severní Ameriky, v severozápadní Evropě, jižní Africe, jihovýchodní Austrálii, Novém Zélandu a části Indie; pokud jde o ostrovy, představuje hotspots především oblast Tichého oceánu. Počty naturalizovaných druhů těsně korelují s bohatostí původních flór, přičemž na ostrovech je korelace těsnější a nárůst rychlejší, což potvrzuje větší náchylnost ostrovů k invazím. Jižní Afrika, Indie, Kalifornie, Kuba, Florida, australský stát Queensland a Japonsko jsou státy s nejvyšším udávaným počtem invazních druhů (tedy těch naturalizovaných druhů, které se rychle šíří). Oblasti temperátního zonobiomu hostí nejvíce naturalizovaných taxonů (9036), následují zonobiom tropický (6774), mediteránní (3280), subtropický (3057) a arktický (321). V Novém světě je zaznamenáno více naturalizovaných taxonů (9905) než ve Starém světě (7923) a tento rozdíl je marginálně průkazný, použijeme-li jako míru nárůstu počtu druhů s plochou. Vzdálenost k nejbližší pevnině, odražející izolovanost ostrova, je nejdůležitějším faktorem určujícím míru invaze naturalizovanými rostlinami na ostrovech, v pevninských oblastech má rozhodující vliv klima spojené s příslušností k zonobiomu a socioekonomické faktory, reprezentované hrubým domácím produktem. Každý z 11 nejrozšířenějších druhů zdomácněl přinejmenším ve třetině z celkového počtu podchycených regionů; nejrozšířenější z nich, *Sonchus oleraceus*, se vyskytuje ve 48 % regionů, které dohromady pokrývají 42 % zemského povrchu. Dalšími široce rozšířenými druhy jsou *Ricinus communis*, *Oxalis corniculata*, *Portulaca oleracea*, *Eleusine indica*, *Chenopodium album*, *Capsella bursa-pastoris*, *Stellaria media*, *Bidens pilosa*, *Datura stramonium* a *Echinochloa crus-galli*. Mezi druhy, které jsou v celosvětovém měřítku nejčastěji invazní, patří *Lantana camara* (druh je zaznamenán ve 120 regionech z 349, pro které je k dispozici klasifikace invazních druhů), *Calotropis procera* (118), *Eichhornia*



*crassipes* (113), *Sonchus oleraceus* (108) a *Leucaena leucocephala* (103). Pokud jde o zastoupení životních forem, na ostrovech je relativně více naturalizovaných dřevin (34,4 %), než na pevnině (29,5 %), a méně jednolétých taxonů (18,7 % ve srovnání s 22,3 %). Nejvíce naturalizovaných taxonů patří do čeledí *Compositae* (1343), *Poaceae* (1267) a *Leguminosae* (1189). Zdomácnělí zástupci některých čeledí (*Arecaceae*, *Araceae*, *Acanthaceae*, *Amaryllidaceae*, *Asparagaceae*, *Convolvulaceae*, *Rubiaceae*, *Malvaceae*) jsou vázáni spíše na ostrovy, čeledi s relativně vyšším výskytem na pevnině je méně (např. *Brassicaceae*, *Caryophyllaceae*, *Boraginaceae*). Vztáhneme-li počty naturalizovaných taxonů k celkové druhové bohatosti dané čeledi, ukazuje se, že některé velké čeledi zahrnují více takových zástupců, než by odpovídalo náhodě (např. *Poaceae*, *Leguminosae*, *Rosaceae*, *Amaranthaceae*, *Pinaceae*), jiné jsou podhodnoceny (např. *Euphorbiaceae*, *Rubiaceae*) a čeleď nejbohatší na naturalizované taxony, *Compositae*, dosahuje hodnot odpovídajících její globální druhové bohatosti. Analýza fylogenetického postavení čeledí s ohledem na zastoupení naturalizovaných zástupců odhalila, že čeledi se zvýšeným naturalizačním potenciálem nejsou z hlediska příbuznosti rozmístěny náhodně a tento fylogenetický signál je statisticky průkazný ( $P = 0.0341$ ). *Solanum* (112 taxonů), *Euphorbia* (108) a *Carex* (106) obsahují nejvíce naturalizovaných taxonů. Rody *Cotoneaster*, *Juncus*, *Eucalyptus*, *Salix*, *Hypericum*, *Geranium* a *Persicaria* jsou relativně zastoupenější na ostrovech, pro pevninské oblasti jsou typické naturalizované taxony rodů *Atriplex*, *Opuntia*, *Oenothera*, *Artemisia*, *Vicia*, *Galium* a *Rosa*. Data představená v článku ukazují také na mezery v současných znalostech a umožňují vymezit oblasti, kam by bylo užitečné napřít úsilí a chybějící informace získat.

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Appendix 1. – Regions included in the GloNAF 1.1 database, with TDWG continent to which it belongs, whether the region is mainland or island indicated (Main/Is), and the zonobiome (I. Tropical (equatorial); II. Tropical (savanna); III. Subtropical (arid); IV. Mediterranean; V. Warm temperate; VI. Temperate (nemoral); VII. Arid (temperate), Continental; VIII. Cold temperate (boreal); IX. Arctic, based on Walter & Breckle 1991). Information is provided on the number of native species; the total number of naturalized alien species and their percentage in the total flora of the region; and number of invasive species (empty cells indicate that the data is not available). The numbers of the naturalized species correspond to van Kleunen et al. (2015) but include updated species numbers in some cases where new data appeared. See text for details on collating the numbers of invasive species. Within mainland and islands, the regions are listed by TDWG continents, and within them alphabetically by countries and subregions. See Table 2 for the numbers of regions for which the data are available in particular continents. The complete set of the 1013 regions for which the data were gathered is presented, including some overlapping regions. Only non-overlapping regions, marked with \* in the NO column were used in analyses ( $n = 844$ ). Data sources for species numbers are given in Electronic Appendix 1 together with additional geographic information on regions (area, coordinates, hemisphere and Old/New world location). Note that in the previous analysis of the historical dynamics of naturalized species exchange and accumulation across the globe (van Kleunen et al. 2015) based on the same data, there were 843 regions compared to 844 used here. This is because in the present paper the data on Baja California and Baja California Sur, merged in van Kleunen et al. (2015), are treated separately.

| Country                          | Subregion     | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|----------------------------------|---------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Algeria                          |               | *  | 328                  | 7.7                | 38              | 3953          | Africa            | main         | IV             |
| Angola                           |               | *  | 227                  | 4.2                | 2               | 5185          | Africa            | main         | II             |
| Benin                            |               | *  | 333                  | 11.4               | 9               | 2584          | Africa            | main         | I              |
| Botswana                         |               | *  | 170                  | 5.3                | 51              | 3041          | Africa            | main         | III            |
| Burkina Faso                     |               | *  | 149                  | 7.2                | 6               | 1918          | Africa            | main         | II             |
| Burundi                          |               | *  | 187                  | 6.0                | 2               | 2909          | Africa            | main         | II             |
| Cameroon                         |               | *  | 296                  | 3.6                | 10              | 7850          | Africa            | main         | I              |
| Central African Republic         |               | *  | 57                   | 1.6                | 2               | 3602          | Africa            | main         | II             |
| Congo                            |               | *  | 56                   | 1.2                | 8               | 4538          | Africa            | main         | I              |
| Cote d'Ivoire                    |               | *  | 266                  | 6.5                | 9               | 3853          | Africa            | main         | I              |
| Democratic Republic of the Congo |               | *  | 522                  | 4.5                | 10              | 11007         | Africa            | main         | I              |
| Djibouti                         |               | *  | 42                   | 6.1                | 1               | 641           | Africa            | main         | III            |
| Egypt                            |               | *  | 179                  | 8.7                | 33              | 1890          | Africa            | main         | III            |
| Equatorial Guinea                |               | *  | 187                  | 5.4                | 1               | 3250          | Africa            | main         | I              |
| Eritrea                          |               | *  | 65                   | 8.5                | 6               | 700           | Africa            | main         | III            |
| Ethiopia                         |               | *  | 421                  | 6.0                | 16              | 6603          | Africa            | main         | II             |
| Gabon                            |               | *  | 94                   | 1.4                | 2               | 6651          | Africa            | main         | I              |
| Gambia                           |               |    | 11                   | 1.1                | 5               | 974           | Africa            | main         | II             |
| Ghana                            |               | *  | 190                  | 6.0                | 16              | 2974          | Africa            | main         | I              |
| Guinea                           |               | *  | 86                   | 2.8                | 8               | 3007          | Africa            | main         | I              |
| Guinea Bissau                    |               |    | 97                   | 6.2                | 3               | 1459          | Africa            | main         | I              |
| Guinea Bissau                    | East region   | *  | 27                   |                    |                 |               | Africa            | main         | I              |
| Guinea Bissau                    | North region  | *  | 40                   |                    |                 |               | Africa            | main         | I              |
| Guinea Bissau                    | South region  | *  | 30                   |                    |                 |               | Africa            | main         | I              |
| Chad                             |               | *  | 274                  | 11.6               | 6               | 2080          | Africa            | main         | III            |
| Kenya                            |               | *  | 145                  | 2.2                | 39              | 6506          | Africa            | main         | II             |
| Lesotho                          |               | *  | 206                  | 6.4                | 2               | 3000          | Africa            | main         | II             |
| Liberia                          |               | *  | 141                  | 6.0                | 4               | 2200          | Africa            | main         | I              |
| Lybia                            |               | *  | 147                  | 7.5                | 2               | 1825          | Africa            | main         | III            |
| Malawi                           |               | *  | 50                   | 1.3                | 9               | 3765          | Africa            | main         | II             |
| Mali                             |               | *  | 74                   | 4.1                | 7               | 1741          | Africa            | main         | III            |
| Mauritania                       |               | *  | 84                   | 7.5                | 3               | 1040          | Africa            | main         | III            |
| Morocco                          |               | *  | 410                  | 8.0                | 8               | 4700          | Africa            | main         | IV             |
| Mozambique                       |               |    | 103                  | 1.8                | 25              | 5692          | Africa            | main         | II             |
| Mozambique                       | Cabo Delgado  | *  | 19                   |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Gaza          | *  | 102                  |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Inhambane     | *  | 44                   |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Manica        | *  | 105                  |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Maputo        | *  | 396                  |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Nampula       | *  | 44                   |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Nassa         | *  | 91                   |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Sofala        | *  | 93                   |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Tete          | *  | 80                   |                    |                 |               | Africa            | main         | I              |
| Mozambique                       | Zambezia      | *  | 56                   |                    |                 |               | Africa            | main         | I              |
| Namibia                          |               | *  | 218                  | 4.8                | 58              | 4300          | Africa            | main         | III            |
| Niger                            |               | *  | 37                   | 2.5                | 7               | 1460          | Africa            | main         | III            |
| Nigeria                          |               | *  | 193                  | 3.9                | 19              | 4715          | Africa            | main         | I              |
| Rwanda                           |               | *  | 229                  | 8.4                | 6               | 2500          | Africa            | main         | II             |
| Senegal                          |               | *  | 97                   | 3.7                | 9               | 2500          | Africa            | main         | II             |
| Sierra Leone                     |               | *  | 76                   | 3.5                | 2               | 2090          | Africa            | main         | I              |
| Somalia                          |               | *  | 63                   | 2.0                | 5               | 3028          | Africa            | main         | III            |
| South Africa                     |               |    | 1040                 | 4.8                | 374             | 20447         | Africa            | main         | several        |
| South Africa                     | Eastern Cape  | *  | 601                  | 7.4                |                 | 7525          | Africa            | main         | II             |
| South Africa                     | Gauteng       | *  | 443                  | 14.6               |                 | 2584          | Africa            | main         | II             |
| South Africa                     | KwaZulu-Natal | *  | 610                  | 7.9                |                 | 7122          | Africa            | main         | II             |



| Country        | Subregion         | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|----------------|-------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| South Africa   | Limpopo           | *  | 372                  | 7.1                |                 | 4866          | Africa            | main         | II             |
| South Africa   | Mpumalanga        | *  | 450                  | 7.9                |                 | 5275          | Africa            | main         | II             |
| South Africa   | North West        | *  | 302                  | 11.4               |                 | 2354          | Africa            | main         | II             |
| South Africa   | Northern Cape     | *  | 265                  | 4.6                |                 | 5517          | Africa            | main         | III            |
| South Africa   | Orange Free State | *  | 342                  | 9.9                |                 | 3096          | Africa            | main         | II             |
| South Africa   | Western Cape      | *  | 551                  | 29.2               |                 | 1337          | Africa            | main         | IV             |
| Sudan          |                   | *  | 59                   | 1.8                | 9               | 3156          | Africa            | main         | III            |
| Swaziland      |                   | *  | 315                  | 10.4               | 10              | 2715          | Africa            | main         | II             |
| Tanzania       |                   | *  | 157                  | 1.5                | 28              | 10008         | Africa            | main         | II             |
| Togo           |                   | *  | 63                   | 2.1                | 3               | 3003          | Africa            | main         | I              |
| Tunisia        |                   | *  | 225                  | 5.9                | 8               | 3573          | Africa            | main         | IV             |
| Uganda         |                   | *  | 152                  | 3.0                | 25              | 4848          | Africa            | main         | II             |
| Western Sahara |                   |    | 1                    |                    |                 |               | Africa            | main         | III            |
| Zambia         |                   |    | 84                   | 1.3                | 13              | 6280          | Africa            | main         | II             |
| Zambia         | Central           | *  | 36                   |                    |                 |               | Africa            | main         | I              |
| Zambia         | Copperbelt        | *  | 43                   |                    |                 |               | Africa            | main         | I              |
| Zambia         | Eastern           | *  | 52                   |                    |                 |               | Africa            | main         | I              |
| Zambia         | Luapula           | *  | 20                   |                    |                 |               | Africa            | main         | I              |
| Zambia         | Lusaka            | *  | 77                   |                    |                 |               | Africa            | main         | I              |
| Zambia         | Northern          | *  | 67                   |                    |                 |               | Africa            | main         | I              |
| Zambia         | North-western     | *  | 34                   |                    |                 |               | Africa            | main         | I              |
| Zambia         | Southern          | *  | 67                   |                    |                 |               | Africa            | main         | I              |
| Zambia         | Western           | *  | 32                   |                    |                 |               | Africa            | main         | I              |
| Zimbabwe       |                   |    | 238                  | 3.9                | 27              | 5930          | Africa            | main         | II             |
| Zimbabwe       | Central region    | *  | 195                  |                    | 77              |               | Africa            | main         | II             |
| Zimbabwe       | Eastern region    | *  | 191                  |                    | 75              |               | Africa            | main         | II             |
| Zimbabwe       | Northern region   | *  | 109                  |                    | 56              |               | Africa            | main         | II             |
| Zimbabwe       | Southern region   | *  | 94                   |                    | 55              |               | Africa            | main         | II             |
| Zimbabwe       | Western region    | *  | 117                  |                    | 58              |               | Africa            | main         | II             |
| Antarctica     |                   | *  | 2                    | 50.0               | 0               | 2             | Antarctica        | main         | IX             |
| Afghanistan    |                   |    | 47                   | 0.9                | 19              | 5000          | Asia-temp         | main         | III            |
| Armenia        |                   |    | 389                  | 9.9                | 20              | 3553          | Asia-temp         | main         | VI             |
| Azerbaijan     |                   |    |                      |                    | 4               | 4300          | Asia-temp         | main         | VII            |
| Azerbaijan     | Talysh            |    | 91                   | 6.5                |                 | 1314          | Asia-temp         | main         | VI             |
| Bahrain        |                   |    |                      |                    | 1               | 195           | Asia-temp         | main         | III            |
| Bhutan         |                   |    |                      |                    | 4               | 5446          | Asia-temp         | main         | II             |
| Georgia        |                   | *  | 148                  | 3.7                | 20              | 3884          | Asia-temp         | main         | VI             |
| China          | Anhui             | *  | 184                  | 6.9                | 58              | 2500          | Asia-temp         | main         | V              |
| China          | Beijing           | *  | 123                  | 8.4                | 57              | 1349          | Asia-temp         | main         | VI             |
| China          | Fujian            | *  | 312                  | 8.6                | 89              | 3328          | Asia-temp         | main         | V              |
| China          | Gansu             | *  | 148                  | 4.3                |                 | 3315          | Asia-temp         | main         | VI             |
| China          | Guangdong         | *  | 387                  | 7.4                | 97              | 4846          | Asia-temp         | main         | V              |
| China          | Guangxi           | *  | 303                  | 9.2                | 82              | 3000          | Asia-temp         | main         | I              |
| China          | Guizhou           | *  | 227                  | 4.1                | 68              | 5288          | Asia-temp         | main         | V              |
| China          | Hebei             | *  | 193                  | 9.1                | 53              | 1937          | Asia-temp         | main         | VI             |
| China          | Heilongjiang      | *  | 151                  | 8.1                | 38              | 1711          | Asia-temp         | main         | VIII           |
| China          | Henan             | *  | 171                  | 5.4                | 49              | 2987          | Asia-temp         | main         | VI             |
| China          | Hongkong          | *  | 167                  | 7.0                | 60              | 2228          | Asia-temp         | main         | V              |
| China          | Hubei             | *  | 196                  | 4.8                | 56              | 3911          | Asia-temp         | main         | V              |
| China          | Hunan             | *  | 201                  | 5.0                | 56              | 3857          | Asia-temp         | main         | V              |
| China          | Chongqing         | *  | 58                   | 1.4                |                 | 4231          | Asia-temp         | main         | V              |
| China          | Jiangsu           | *  | 234                  | 12.7               | 66              | 1606          | Asia-temp         | main         | V              |
| China          | Jiangxi           | *  | 212                  | 6.6                | 62              | 3021          | Asia-temp         | main         | V              |
| China          | Jilin             | *  | 134                  | 7.3                |                 | 1698          | Asia-temp         | main         | VI             |
| China          | Liaoning          | *  | 155                  | 9.5                |                 | 1485          | Asia-temp         | main         | VI             |



| Country     | Subregion                       | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|-------------|---------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| China       | Macau                           | *  | 83                   | 13.7               |                 | 523           | Asia-temp         | main         | V              |
| China       | Nei Mongol                      | *  | 145                  | 6.3                |                 | 2142          | Asia-temp         | main         | VII            |
| China       | Ningxia Hui                     | *  | 109                  | 7.9                | 17              | 1270          | Asia-temp         | main         | VI             |
| China       | Qinghai                         | *  | 118                  | 4.3                | 23              | 2614          | Asia-temp         | main         | VI             |
| China       | Shaanxi                         | *  | 164                  | 4.7                | 35              | 3318          | Asia-temp         | main         | VI             |
| China       | Shandong                        | *  | 176                  | 12.6               | 52              | 1219          | Asia-temp         | main         | VI             |
| China       | Shanghai                        | *  | 94                   | 15.8               | 36              | 500           | Asia-temp         | main         | V              |
| China       | Shanxi                          | *  | 137                  | 7.0                |                 | 1830          | Asia-temp         | main         | VI             |
| China       | Sichuan                         | *  | 250                  | 2.8                | 73              | 8722          | Asia-temp         | main         | V              |
| China       | Tianjin                         | *  | 86                   | 10.1               | 24              | 768           | Asia-temp         | main         | VI             |
| China       | Xinjiang Uygur                  | *  | 161                  | 4.4                | 34              | 3494          | Asia-temp         | main         | VII            |
| China       | Xizang                          | *  | 151                  | 2.4                | 3               | 6106          | Asia-temp         | main         | VI             |
| China       | Yunnan                          | *  | 395                  | 2.8                | 98              | 13528         | Asia-temp         | main         | V              |
| China       | Zhejiang                        | *  | 229                  | 7.4                | 76              | 2847          | Asia-temp         | main         | V              |
| Iran        |                                 |    | 79                   | 1.0                | 13              | 8200          | Asia-temp         | main         | III            |
| Iraq        |                                 |    |                      |                    | 10              | 3300          | Asia-temp         | main         | III            |
| Israel      |                                 | *  | 167                  | 5.7                | 69              | 2750          | Asia-temp         | main         | IV             |
| Jordan      |                                 |    |                      |                    | 4               | 2100          | Asia-temp         | main         | III            |
| Kazakhstan  |                                 |    |                      |                    | 2               | 6000          | Asia-temp         | main         | VII            |
| Kazakhstan  | Aral Caspian                    |    | 51                   | 3.7                |                 | 1313          | Asia-temp         | main         | VII            |
| Kazakhstan  | Dzungeria Tarbatagai            |    | 53                   | 3.4                |                 | 1499          | Asia-temp         | main         | VII            |
| Kazakhstan  | Lake Balkhash Area              |    | 56                   | 3.5                |                 | 1555          | Asia-temp         | main         | VII            |
| Kyrgyzstan  |                                 | *  | 74                   | 1.9                |                 | 3869          | Asia-temp         | main         | VII            |
| Lebanon     |                                 |    |                      |                    | 2               | 2790          | Asia-temp         | main         | IV             |
| Mongolia    |                                 |    | 39                   | 1.3                | 1               | 3000          | Asia-temp         | main         | VII            |
| North Korea |                                 | *  | 71                   | 2.4                | 18              | 2898          | Asia-temp         | main         | VI             |
| Oman        |                                 | *  | 40                   | 3.2                | 6               | 1204          | Asia-temp         | main         | III            |
| Qatar       |                                 | *  | 127                  | 32.0               | 1               | 270           | Asia-temp         | main         | III            |
| Russia      |                                 |    | 1203                 | 8.8                | 159             | 12500         | Asia-temp         | main         | several        |
| Russia      | boreal subregion                |    | 71                   | 4.3                |                 | 1586          | Asia-temp         | main         | VIII           |
| Russia      | Altai Republic                  | *  | 37                   | 1.9                | 2               | 1963          | Asia-temp         | main         | VIII           |
| Russia      | Amur Region                     |    | 127                  | 8.0                |                 | 1469          | Asia-temp         | main         | VIII           |
| Russia      | Anadyr                          |    | 3                    | 0.9                |                 | 344           | Asia-temp         | main         | IX             |
| Russia      | Arctic Siberia                  |    | 0                    |                    |                 | 397           | Asia-temp         | main         | IX             |
| Russia      | Buryat                          | *  | 41                   | 2.0                | 1               | 2043          | Asia-temp         | main         | VIII           |
| Russia      | Ciscaucasia                     |    | 124                  | 4.5                |                 | 2621          | Asia-temp         | main         | VI             |
| Russia      | Dagestan                        |    | 99                   | 4.8                |                 | 1947          | Asia-temp         | main         | VI             |
| Russia      | Chukotka                        |    | 3                    | 0.9                |                 | 323           | Asia-temp         | main         | IX             |
| Russia      | Irkutsk                         | *  | 59                   | 3.1                | 3               | 1837          | Asia-temp         | main         | VIII           |
| Russia      | Kamchatka                       |    | 16                   | 2.1                |                 | 751           | Asia-temp         | main         | VIII           |
| Russia      | Kemerovo                        | *  | 75                   | 6.0                | 2               | 1165          | Asia-temp         | main         | VIII           |
| Russia      | Khabarovsk                      | *  | 401                  |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Khakass                         | *  | 26                   | 1.7                | 1               | 1525          | Asia-temp         | main         | VIII           |
| Russia      | Kolyvan Tomsk Plateai east reg. |    | 236                  |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Kolyvan Tomsk Plateai west reg. |    | 110                  |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Krasnoyarsk Krai                | *  | 67                   | 2.9                | 0               | 2244          | Asia-temp         | main         | VIII           |
| Russia      | Kuznetsk Alatau east region     |    | 37                   |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Kuznetsk Alatau north region    |    | 51                   |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Kuznetsk Alatau west region     |    | 36                   |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Kuznetsk Depression             |    | 155                  |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Lena Kolyma                     |    | 22                   | 2.2                |                 | 985           | Asia-temp         | main         | IX             |
| Russia      | Magadan region                  | *  | 222                  | 17.6               |                 | 1037          | Asia-temp         | main         | VIII           |
| Russia      | Mountain Shoriya Gerneya Shoria |    | 69                   |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Nazarov Minusinsk Hollow        |    | 64                   |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia      | Nord Altai                      |    | 86                   |                    |                 |               | Asia-temp         | main         | VIII           |

| Country              | Subregion                   | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|----------------------|-----------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Russia               | North east Preteletsk Altai |    | 73                   |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia               | North west Altai            |    | 175                  |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia               | Novosibirsk                 | *  | 44                   | 3.6                | 1               | 1168          | Asia-temp         | main         | VIII           |
| Russia               | Omsk                        | *  | 72                   | 6.7                | 2               | 1007          | Asia-temp         | main         | VIII           |
| Russia               | Republic of Tyva            | *  | 17                   | 0.9                | 0               | 1867          | Asia-temp         | main         | VIII           |
| Russia               | Salair                      |    | 86                   |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia               | Tomsk                       | *  | 60                   | 5.7                | 1               | 986           | Asia-temp         | main         | VIII           |
| Russia               | Ussuri                      |    | 59                   | 3.8                |                 | 1501          | Asia-temp         | main         | VI             |
| Russia               | West Altai                  |    | 109                  |                    |                 |               | Asia-temp         | main         | VIII           |
| Russia               | Zabaykalsky Krai            | *  | 22                   | 1.3                | 1               | 1735          | Asia-temp         | main         | VIII           |
| Saudi Arabia         |                             | *  | 50                   | 2.2                | 10              | 2253          | Asia-temp         | main         | III            |
| South Korea          |                             | *  | 270                  | 5.5                |                 | 4662          | Asia-temp         | main         | VI             |
| Supranational reg.   | Altai                       | *  | 71                   | 3.6                | 6               | 1884          | Asia-temp         | main         | VIII           |
| Supranational reg.   | Amu Darya Foothills         |    | 44                   | 6.5                |                 | 638           | Asia-temp         | main         | VII            |
| Supranational reg.   | Eastern Transcaucasia       |    | 143                  | 4.3                |                 | 3178          | Asia-temp         | main         | VI             |
| Supranational reg.   | Irtysk                      |    | 48                   | 3.3                |                 | 1428          | Asia-temp         | main         | VIII           |
| Supranational reg.   | Kazyl Kum                   |    | 33                   | 4.3                |                 | 731           | Asia-temp         | main         | VII            |
| Supranational reg.   | Lower Volga                 |    | 89                   | 6.3                |                 | 1328          | Asia-temp         | main         | VII            |
| Supranational reg.   | Pamir Altai                 |    | 81                   | 2.5                |                 | 3176          | Asia-temp         | main         | VIII           |
| Supranational reg.   | Southern Transcaucasia      |    | 116                  | 4.0                |                 | 2758          | Asia-temp         | main         | VI             |
| Supranational reg.   | Syr Darya Foothills         |    | 65                   | 5.1                |                 | 1201          | Asia-temp         | main         | VII            |
| Supranational reg.   | Tien shan                   |    | 77                   | 2.8                |                 | 2693          | Asia-temp         | main         | VII            |
| Supranational reg.   | Upper Tobol                 |    | 81                   | 5.7                |                 | 1349          | Asia-temp         | main         | VIII           |
| Syria                |                             |    |                      |                    | 7               | 3110          | Asia-temp         | main         | IV             |
| Tajikistan           |                             |    |                      |                    | 1               | 4550          | Asia-temp         | main         | VII            |
| Turkey               |                             |    | 356                  | 3.8                | 23              | 8988          | Asia-temp         | main         | IV             |
| Turkmenistan         |                             |    |                      |                    | 1               | 3000          | Asia-temp         | main         | VII            |
| Turkmenistan         | Kara Kum                    |    | 36                   | 4.5                |                 | 766           | Asia-temp         | main         | VII            |
| Turkmenistan         | Montane Turkmenistan        |    | 71                   | 4.4                |                 | 1532          | Asia-temp         | main         | VII            |
| United Arab Emirates |                             |    |                      |                    | 4               | 678           | Asia-temp         | main         | III            |
| Yemen                |                             | *  | 62                   | 2.4                | 8               | 2559          | Asia-temp         | main         | III            |
| Bangladesh           |                             |    |                      |                    | 19              | 5000          | Asia-trop         | main         | II             |
| Cambodia             |                             |    |                      |                    | 29              | 2308          | Asia-trop         | main         | II             |
| India                |                             |    | 730                  | 3.8                | 352             | 18664         | Asia-trop         | main         | II             |
| India                | Andhra Pradesh              | *  | 323                  |                    | 10              |               | Asia-trop         | main         | II             |
| India                | Arunachal Pradesh           | *  | 282                  | 6.5                | 14              | 4055          | Asia-trop         | main         | II             |
| India                | Assam                       | *  | 297                  |                    | 17              |               | Asia-trop         | main         | II             |
| India                | Bihar                       | *  | 288                  |                    | 8               |               | Asia-trop         | main         | II             |
| India                | Delhi                       | *  | 277                  | 34.3               | 7               | 531           | Asia-trop         | main         | II             |
| India                | Goa                         | *  | 270                  |                    | 7               |               | Asia-trop         | main         | II             |
| India                | Gujarat                     | *  | 292                  | 14.0               | 8               | 1800          | Asia-trop         | main         | II             |
| India                | Haryana                     | *  | 283                  |                    | 5               |               | Asia-trop         | main         | II             |
| India                | Himachal Pradesh            | *  | 340                  | 22.0               | 18              | 1202          | Asia-trop         | main         | II             |
| India                | Chandigarh                  | *  | 251                  |                    | 6               |               | Asia-trop         | main         | II             |
| India                | Chhattisgarh                | *  | 239                  |                    | 2               |               | Asia-trop         | main         | II             |
| India                | Jammu and Kashmir           | *  | 339                  |                    | 20              |               | Asia-trop         | main         | II             |
| India                | Jharkhand                   | *  | 238                  |                    | 1               |               | Asia-trop         | main         | II             |
| India                | Karnataka                   | *  | 376                  | 9.9                | 11              | 3410          | Asia-trop         | main         | II             |
| India                | Kerala                      | *  | 374                  |                    | 7               |               | Asia-trop         | main         | II             |
| India                | Madhya Pradesh              | *  | 287                  | 25.2               | 6               | 852           | Asia-trop         | main         | II             |
| India                | Maharashtra                 | *  | 352                  |                    | 8               |               | Asia-trop         | main         | II             |
| India                | Manipur                     | *  | 259                  | 10.6               | 14              | 2191          | Asia-trop         | main         | II             |
| India                | Meghalaya                   | *  | 276                  |                    | 15              |               | Asia-trop         | main         | II             |
| India                | Mizoram                     | *  | 251                  |                    | 12              |               | Asia-trop         | main         | II             |
| India                | Nagaland                    | *  | 260                  |                    | 16              |               | Asia-trop         | main         | II             |

| Country   | Subregion              | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|-----------|------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| India     | Orissa                 | *  | 283                  | 10.0               | 6               | 2561          | Asia-trop         | main         | II             |
| India     | Puducherry             | *  | 265                  |                    |                 |               | Asia-trop         | main         | II             |
| India     | Punjab                 | *  | 307                  | 21.5               | 6               | 1119          | Asia-trop         | main         | II             |
| India     | Rajasthan              | *  | 321                  | 30.0               | 5               | 750           | Asia-trop         | main         | II             |
| India     | Sikkim                 | *  | 302                  | 6.6                | 15              | 4250          | Asia-trop         | main         | II             |
| India     | Tamil Nadu             | *  | 439                  | 18.0               | 12              | 2000          | Asia-trop         | main         | II             |
| India     | Tripura                | *  | 256                  |                    | 14              |               | Asia-trop         | main         | II             |
| India     | Uttar Pradesh          | *  | 316                  |                    | 15              |               | Asia-trop         | main         | II             |
| India     | Uttaranchal            | *  | 337                  |                    | 12              |               | Asia-trop         | main         | II             |
| India     | West Bengal            | *  | 350                  |                    | 14              |               | Asia-trop         | main         | II             |
| Laos      |                        | *  | 204                  | 4.0                | 5               | 4850          | Asia-trop         | main         | II             |
| Malaysia  |                        |    |                      |                    | 31              | 15000         | Asia-trop         | main         | I              |
| Malaysia  | Malaysia Peninsula     | *  | 218                  | 2.6                | 36              | 8070          | Asia-trop         | main         | I              |
| Myanmar   |                        |    |                      |                    | 17              | 7000          | Asia-trop         | main         | II             |
| Nepal     |                        | *  | 154                  | 2.2                | 18              | 6973          | Asia-trop         | main         | II             |
| Pakistan  |                        |    | 439                  | 6.8                | 71              | 6000          | Asia-trop         | main         | III            |
| Thailand  |                        | *  | 252                  | 2.1                | 35              | 11625         | Asia-trop         | main         | II             |
| Vietnam   |                        |    |                      |                    | 39              | 13700         | Asia-trop         | main         | II             |
| Australia | Australia Victoria     | *  | 1269                 | 31.4               | 84              | 2773          | Australasia       | main         | V              |
| Australia | Avon Wheatbelt         | *  | 380                  | 6.5                |                 | 5463          | Australasia       | main         | IV             |
| Australia | Burke                  | *  | 207                  | 8.8                |                 | 2133          | Australasia       | main         | II             |
| Australia | Burnett                | *  | 403                  | 18.0               |                 | 1837          | Australasia       | main         | II             |
| Australia | Carnarvon              | *  | 132                  | 6.8                |                 | 1810          | Australasia       | main         | IV             |
| Australia | Central Coast          | *  | 1045                 | 30.6               |                 | 2374          | Australasia       | main         | II             |
| Australia | Central Kimberley      | *  | 71                   | 4.4                |                 | 1549          | Australasia       | main         | III            |
| Australia | Central Ranges         | *  | 8                    | 1.1                |                 | 751           | Australasia       | main         | III            |
| Australia | Central Tablelands     | *  | 622                  | 22.9               |                 | 2090          | Australasia       | main         | II             |
| Australia | Central Western Slopes | *  | 596                  | 24.8               |                 | 1811          | Australasia       | main         | II             |
| Australia | Cook                   | *  | 684                  | 12.4               |                 | 4846          | Australasia       | main         | I              |
| Australia | Coolgardie             | *  | 172                  | 5.5                |                 | 2971          | Australasia       | main         | IV             |
| Australia | Dampierland            | *  | 120                  | 6.6                |                 | 1710          | Australasia       | main         | III            |
| Australia | Darling Downs          | *  | 589                  | 19.8               |                 | 2385          | Australasia       | main         | II             |
| Australia | Eastern                | *  | 153                  | 14.6               |                 | 898           | Australasia       | main         | III            |
| Australia | Esperance Plains       | *  | 316                  | 7.0                |                 | 4209          | Australasia       | main         | IV             |
| Australia | Eyre Peninsula         | *  | 464                  | 21.3               |                 | 1712          | Australasia       | main         | III            |
| Australia | Flinders Ranges        | *  | 360                  | 20.7               |                 | 1380          | Australasia       | main         | III            |
| Australia | Gairdner-Torrens       | *  | 126                  | 11.4               |                 | 979           | Australasia       | main         | III            |
| Australia | Gascoyne               | *  | 29                   | 1.9                |                 | 1532          | Australasia       | main         | III            |
| Australia | Geraldton Sandplains   | *  | 299                  | 7.3                |                 | 3825          | Australasia       | main         | IV             |
| Australia | Gibson Desert          | *  | 4                    | 0.6                |                 | 668           | Australasia       | main         | III            |
| Australia | Great Sandy Desert     | *  | 9                    | 1.0                |                 | 888           | Australasia       | main         | III            |
| Australia | Great Victoria Desert  | *  | 9                    | 0.9                |                 | 996           | Australasia       | main         | III            |
| Australia | Gregory North          | *  | 76                   | 6.3                |                 | 1137          | Australasia       | main         | II             |
| Australia | Gregory South          | *  | 69                   | 7.7                |                 | 830           | Australasia       | main         | II             |
| Australia | Hampton                | *  | 36                   | 9.2                |                 | 357           | Australasia       | main         | III            |
| Australia | Jarrah Forest          | *  | 648                  | 10.8               |                 | 5353          | Australasia       | main         | IV             |
| Australia | Lake Eyre              | *  | 124                  | 9.3                |                 | 1213          | Australasia       | main         | III            |
| Australia | Leichhardt             | *  | 365                  | 14.1               |                 | 2222          | Australasia       | main         | II             |
| Australia | Little Sandy Desert    | *  | 10                   | 0.9                |                 | 1048          | Australasia       | main         | III            |
| Australia | Mallee                 | *  | 214                  | 5.3                |                 | 3816          | Australasia       | main         | IV             |
| Australia | Maranoa                | *  | 246                  | 14.2               |                 | 1485          | Australasia       | main         | II             |
| Australia | Mitchell               | *  | 190                  | 10.7               |                 | 1585          | Australasia       | main         | II             |
| Australia | Moreton                | *  | 936                  | 25.0               |                 | 2802          | Australasia       | main         | II             |
| Australia | Murchison              | *  | 95                   | 3.9                |                 | 2364          | Australasia       | main         | III            |
| Australia | Murray                 | *  | 554                  | 26.5               |                 | 1537          | Australasia       | main         | III            |

| Country         | Subregion                      | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|-----------------|--------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Australia       | New South Wales                |    | 1584                 | 25.3               | 145             | 4677          | Australasia       | main         | V              |
| Australia       | North Coast                    | *  | 915                  | 23.8               |                 | 2928          | Australasia       | main         | II             |
| Australia       | North Far Western Plains       | *  | 490                  | 32.2               |                 | 1030          | Australasia       | main         | III            |
| Australia       | North Kennedy                  | *  | 561                  | 13.7               |                 | 3548          | Australasia       | main         | II             |
| Australia       | North Western Plains           | *  | 370                  | 19.7               |                 | 1508          | Australasia       | main         | III            |
| Australia       | North Western Slopes           | *  | 584                  | 26.7               |                 | 1607          | Australasia       | main         | II             |
| Australia       | Northern Kimberley             | *  | 122                  | 5.1                |                 | 2267          | Australasia       | main         | III            |
| Australia       | Northern Lofty                 | *  | 545                  | 32.8               |                 | 1118          | Australasia       | main         | III            |
| Australia       | Northern Tablelands            | *  | 446                  | 18.6               |                 | 1948          | Australasia       | main         | II             |
| Australia       | Northern Territory             | *  | 398                  | 10.8               | 72              | 3293          | Australasia       | main         | III            |
| Australia       | North-Western                  | *  | 55                   | 4.7                |                 | 1108          | Australasia       | main         | III            |
| Australia       | Nullarbor (Western Australia)  | *  | 52                   | 8.8                |                 | 539           | Australasia       | main         | III            |
| Australia       | Nullarbor (Southern Australia) | *  | 81                   | 11.9               |                 | 602           | Australasia       | main         | III            |
| Australia       | Ord Victoria Plain             | *  | 50                   | 4.4                |                 | 1099          | Australasia       | main         | III            |
| Australia       | Pilbara                        | *  | 81                   | 3.9                |                 | 1970          | Australasia       | main         | III            |
| Australia       | Port Curtis                    | *  | 500                  | 17.3               |                 | 2387          | Australasia       | main         | II             |
| Australia       | Queensland                     |    | 1316                 | 14.1               | 165             | 8005          | Australasia       | main         | II             |
| Australia       | South Australia                |    | 1267                 | 27.0               | 71              | 3418          | Australasia       | main         | III            |
| Australia       | South Coast                    | *  | 423                  | 18.5               |                 | 1868          | Australasia       | main         | II             |
| Australia       | South Far Western Plains       | *  | 177                  | 17.9               |                 | 810           | Australasia       | main         | III            |
| Australia       | South Kennedy                  | *  | 446                  | 15.2               |                 | 2492          | Australasia       | main         | II             |
| Australia       | South Western Plains           | *  | 436                  | 26.4               |                 | 1218          | Australasia       | main         | III            |
| Australia       | South Western Slopes           | *  | 477                  | 32.8               |                 | 977           | Australasia       | main         | II             |
| Australia       | South-Eastern                  | *  | 631                  | 30.3               |                 | 1451          | Australasia       | main         | III            |
| Australia       | Southern Lofty                 | *  | 1013                 | 40.8               |                 | 1472          | Australasia       | main         | III            |
| Australia       | Southern Tablelands            | *  | 573                  | 21.8               |                 | 2054          | Australasia       | main         | II             |
| Australia       | Swan Coastal Plain             | *  | 747                  | 14.3               |                 | 4470          | Australasia       | main         | IV             |
| Australia       | Tanami                         | *  | 6                    | 1.5                |                 | 401           | Australasia       | main         | III            |
| Australia       | Victoria Bonaparte             | *  | 138                  | 8.6                |                 | 1475          | Australasia       | main         | III            |
| Australia       | Warrego                        | *  | 212                  | 13.4               |                 | 1366          | Australasia       | main         | II             |
| Australia       | Warren                         | *  | 482                  | 14.5               |                 | 2851          | Australasia       | main         | IV             |
| Australia       | Western Australia              |    | 1186                 | 12.1               | 91              | 8588          | Australasia       | main         | IV             |
| Australia       | Wide Bay                       | *  | 597                  | 21.4               |                 | 2188          | Australasia       | main         | II             |
| Australia       | Yalgoo                         | *  | 59                   | 2.8                |                 | 2026          | Australasia       | main         | IV             |
| Australia       | Yorke Peninsula                | *  | 364                  | 29.0               |                 | 890           | Australasia       | main         | III            |
| Austria         |                                | *  | 257                  | 7.9                | 17              | 3007          | Europe            | main         | VI             |
| Albania         |                                | *  | 106                  | 2.7                | 7               | 3758          | Europe            | main         | IV             |
| Belarus         |                                | *  | 187                  |                    | 33              |               | Europe            | main         | VI             |
| Belgium         |                                | *  | 508                  | 26.9               | 84              | 1378          | Europe            | main         | VI             |
| Bulgaria        |                                | *  | 593                  | 12.9               | 85              | 3997          | Europe            | main         | VI             |
| Croatia         |                                | *  | 300                  | 6.6                | 100             | 4275          | Europe            | main         | IV             |
| Czech Republic  |                                | *  | 249                  | 9.4                | 86              | 2401          | Europe            | main         | VI             |
| Denmark         |                                | *  | 430                  | 29.1               | 37              | 1050          | Europe            | main         | VI             |
| Estonia         |                                | *  | 232                  | 13.9               | 54              | 1441          | Europe            | main         | VI             |
| Finland         |                                | *  | 125                  | 9.2                | 30              | 1240          | Europe            | main         | VIII           |
| France          |                                | *  | 716                  | 17.5               | 69              | 3382          | Europe            | main         | VI             |
| Germany         |                                | *  | 451                  | 14.1               | 60              | 2749          | Europe            | main         | VI             |
| Greece          |                                | *  | 136                  | 2.8                | 50              | 4652          | Europe            | main         | IV             |
| Hungary         |                                | *  | 141                  | 5.0                | 28              | 2678          | Europe            | main         | VI             |
| Italy           |                                | *  | 478                  | 6.9                | 139             | 6400          | Europe            | main         | IV             |
| Latvia          |                                | *  | 274                  | 17.7               | 23              | 1277          | Europe            | main         | VI             |
| Liechtenstein   |                                | *  | 77                   | 5.2                | 3               | 1410          | Europe            | main         | VI             |
| Lithuania       |                                | *  | 259                  | 16.3               | 23              | 1334          | Europe            | main         | VI             |
| Luxembourg      |                                | *  | 105                  | 7.4                |                 | 1323          | Europe            | main         | VI             |
| Macedonia (FYR) |                                | *  | 17                   |                    |                 |               | Europe            | main         | IV             |

| Country            | Subregion              | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|--------------------|------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Moldova            |                        | *  | 186                  |                    | 37              |               | Europe            | main         | VII            |
| Montenegro         |                        |    |                      | 0.0                | 51              | 3650          | Europe            | main         | VI             |
| Netherlands        |                        | *  | 230                  | 13.4               | 21              | 1490          | Europe            | main         | VI             |
| Norway             |                        | *  | 595                  | 32.2               | 12              | 1253          | Europe            | main         | VIII           |
| Poland             |                        | *  | 386                  | 14.5               | 25              | 2283          | Europe            | main         | VI             |
| Portugal           |                        | *  | 254                  | 9.7                | 31              | 2367          | Europe            | main         | IV             |
| Romania            |                        | *  | 108                  | 3.3                | 10              | 3123          | Europe            | main         | VI             |
| Russia             | Arctic European        |    | 5                    | 1.1                |                 | 444           | Europe            | main         | IX             |
| Russia             | Dvina Pechora          |    | 56                   | 5.2                |                 | 1024          | Europe            | main         | VIII           |
| Russia             | Karelia Lapland        |    | 50                   | 5.1                |                 | 921           | Europe            | main         | VIII           |
| Russia             | Ladoga Ilmen           |    | 87                   | 6.6                |                 | 1229          | Europe            | main         | VIII           |
| Russia             | Leningrad              | *  | 172                  | 8.7                | 33              | 1812          | Europe            | main         | VIII           |
| Russia             | Lipetsk                | *  | 154                  | 11.2               | 71              | 1224          | Europe            | main         | VI             |
| Russia             | Lower Don              |    | 104                  | 6.5                |                 | 1488          | Europe            | main         | VII            |
| Russia             | Mordovia               | *  | 164                  | 13.9               | 55              | 1015          | Europe            | main         | VI             |
| Russia             | Moskva                 | *  | 649                  | 36.7               | 86              | 1117          | Europe            | main         | VIII           |
| Russia             | Ryazan                 | *  | 140                  | 12.2               | 58              | 1012          | Europe            | main         | VI             |
| Russia             | Tula                   | *  | 150                  | 12.9               | 52              | 1009          | Europe            | main         | VI             |
| Russia             | Tver                   | *  | 178                  | 12.4               | 49              | 1255          | Europe            | main         | VIII           |
| Russia             | Volga Kama             |    | 78                   | 5.2                |                 | 1431          | Europe            | main         | VIII           |
| Russia             | Voronezh               | *  | 209                  | 10.7               | 69              | 1741          | Europe            | main         | VI             |
| Serbia             |                        |    | 147                  | 3.9                | 9               | 3662          | Europe            | main         | VI             |
| Slovakia           |                        | *  | 162                  | 4.9                | 34              | 3124          | Europe            | main         | VI             |
| Slovenia           |                        | *  | 230                  | 7.6                | 32              | 2800          | Europe            | main         | VI             |
| Spain              |                        | *  | 454                  | 8.2                | 61              | 5050          | Europe            | main         | IV             |
| Supranational reg. | Bessarabia             |    | 96                   | 9.5                |                 | 917           | Europe            | main         | VI             |
| Supranational reg. | Middle Dnieper         |    | 124                  | 7.1                |                 | 1612          | Europe            | main         | VI             |
| Supranational reg. | Transvolga Area        |    | 78                   | 5.6                |                 | 1308          | Europe            | main         | VII            |
| Supranational reg. | Upper Dnieper          |    | 96                   | 6.3                |                 | 1425          | Europe            | main         | VI             |
| Sweden             |                        | *  | 874                  | 34.8               | 40              | 1638          | Europe            | main         | VIII           |
| Switzerland        |                        | *  | 93                   | 3.6                | 27              | 2505          | Europe            | main         | VI             |
| Turkey             | Turkey (European part) | *  | 94                   |                    |                 |               | Europe            | main         | IV             |
| Ukraine            | Black Sea Area         |    | 125                  | 6.9                |                 | 1689          | Europe            | main         | VII            |
| Ukraine            | Crimea                 |    | 138                  | 6.4                |                 | 2014          | Europe            | main         | VI             |
| Ukraine            | Ukraine                | *  | 626                  | 22.7               | 13              | 2130          | Europe            | main         | VI             |
| Ukraine            | Upper Dniester         |    | 92                   | 8.2                |                 | 1029          | Europe            | main         | VI             |
| Canada             | Alberta                | *  | 360                  | 17.8               | 57              | 1657          | North-Amer        | main         | VIII           |
| Canada             | British Columbia       | *  | 934                  | 28.2               | 93              | 2373          | North-Amer        | main         | VIII           |
| Canada             | Labrador               | *  | 130                  | 14.8               | 0               | 749           | North-Amer        | main         | VIII           |
| Canada             | Manitoba               | *  | 366                  | 20.7               | 67              | 1405          | North-Amer        | main         | VIII           |
| Canada             | New Brunswick          | *  | 586                  | 31.7               | 24              | 1265          | North-Amer        | main         | VI             |
| Canada             | Northwest Territories  | *  | 118                  | 9.9                | 1               | 1079          | North-Amer        | main         | VIII           |
| Canada             | Nova Scotia            | *  | 662                  | 35.0               | 36              | 1231          | North-Amer        | main         | VIII           |
| Canada             | Nunavut                | *  | 14                   | 2.4                | 2               | 560           | North-Amer        | main         | IX             |
| Canada             | Ontario                | *  | 1108                 | 33.0               | 68              | 2248          | North-Amer        | main         | VIII           |
| Canada             | Québec                 | *  | 862                  | 28.1               | 53              | 2202          | North-Amer        | main         | VIII           |
| Canada             | Saskatchewan           | *  | 379                  | 22.2               | 59              | 1325          | North-Amer        | main         | VIII           |
| Canada             | Yukon                  | *  | 161                  | 12.7               | 5               | 1111          | North-Amer        | main         | VIII           |
| Mexico             |                        |    | 519                  | 2.0                | 77              | 26071         | North-Amer        | main         | several        |
| Mexico             | Aguascalientes         | *  | 108                  | 6.6                |                 | 1520          | North-Amer        | main         | III            |
| Mexico             | Baja California        | *  | 219                  | 9.4                |                 | 2111          | North-Amer        | main         | III            |
| Mexico             | Baja California Sur    | *  | 114                  | 6.3                |                 | 1700          | North-Amer        | main         | III            |
| Mexico             | Campeche               | *  | 117                  | 5.6                |                 | 1970          | North-Amer        | main         | II             |
| Mexico             | Coahuila               | *  | 180                  | 5.4                |                 | 3125          | North-Amer        | main         | III            |
| Mexico             | Colima                 | *  | 85                   | 4.5                |                 | 1807          | North-Amer        | main         | II             |

| Country | Subregion            | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|---------|----------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Mexico  | Durango              | *  | 125                  | 3.7                |                 | 3288          | North-Amer        | main         | III            |
| Mexico  | Guanajuato           | *  | 92                   | 5.0                |                 | 1755          | North-Amer        | main         | III            |
| Mexico  | Guerrero             | *  | 123                  | 2.6                |                 | 4648          | North-Amer        | main         | II             |
| Mexico  | Hidalgo              | *  | 193                  | 5.6                |                 | 3239          | North-Amer        | main         | II             |
| Mexico  | Chiapas              | *  | 289                  | 3.7                |                 | 7573          | North-Amer        | main         | I              |
| Mexico  | Chihuahua            | *  | 148                  | 4.2                |                 | 3356          | North-Amer        | main         | III            |
| Mexico  | Jalisco              | *  | 217                  | 4.1                |                 | 5105          | North-Amer        | main         | II             |
| Mexico  | Mexico state         | *  | 236                  | 6.5                |                 | 3401          | North-Amer        | main         | III            |
| Mexico  | Michoacan            | *  | 241                  | 4.9                |                 | 4672          | North-Amer        | main         | II             |
| Mexico  | Morelos              | *  | 213                  | 6.4                |                 | 3134          | North-Amer        | main         | III            |
| Mexico  | Nayarit              | *  | 117                  | 3.3                |                 | 3428          | North-Amer        | main         | II             |
| Mexico  | Nuevo Leon           | *  | 125                  | 4.6                |                 | 2600          | North-Amer        | main         | III            |
| Mexico  | Oaxaca               | *  | 218                  | 2.9                |                 | 7399          | North-Amer        | main         | II             |
| Mexico  | Puebla               | *  | 175                  | 5.2                |                 | 3200          | North-Amer        | main         | II             |
| Mexico  | Queretaro            | *  | 147                  | 4.8                |                 | 2887          | North-Amer        | main         | III            |
| Mexico  | Quintana Roo         | *  | 76                   | 4.8                |                 | 1501          | North-Amer        | main         | I              |
| Mexico  | San Luis Potosi      | *  | 102                  | 3.4                |                 | 2858          | North-Amer        | main         | II             |
| Mexico  | Sinaloa              | *  | 128                  | 4.6                |                 | 2668          | North-Amer        | main         | II             |
| Mexico  | Sonora               | *  | 162                  | 5.0                |                 | 3079          | North-Amer        | main         | III            |
| Mexico  | Tabasco              | *  | 113                  | 4.7                |                 | 2292          | North-Amer        | main         | II             |
| Mexico  | Tamaulipas           | *  | 128                  | 4.3                |                 | 2824          | North-Amer        | main         | II             |
| Mexico  | Tlaxcala             | *  | 104                  | 9.0                |                 | 1049          | North-Amer        | main         | III            |
| Mexico  | Veracruz             | *  | 333                  | 4.6                |                 | 6869          | North-Amer        | main         | II             |
| Mexico  | Yucatan              | *  | 98                   | 6.1                |                 | 1499          | North-Amer        | main         | II             |
| Mexico  | Zacatecas            | *  | 92                   | 3.9                |                 | 2251          | North-Amer        | main         | III            |
| USA     | Alabama              | *  | 1125                 | 26.3               | 92              | 3148          | North-Amer        | main         | VI             |
| USA     | Alaska               | *  | 288                  | 16.7               | 24              | 1432          | North-Amer        | main         | VIII           |
| USA     | Arizona              | *  | 644                  | 14.7               | 82              | 3749          | North-Amer        | main         | III            |
| USA     | Arkansas             | *  | 706                  | 23.9               | 65              | 2244          | North-Amer        | main         | VI             |
| USA     | California           | *  | 1753                 | 23.7               | 209             | 5647          | North-Amer        | main         | IV             |
| USA     | Colorado             | *  | 588                  | 17.5               | 65              | 2781          | North-Amer        | main         | VII            |
| USA     | Connecticut          | *  | 1109                 | 37.3               | 100             | 1864          | North-Amer        | main         | VI             |
| USA     | Delaware             | *  | 748                  | 30.5               | 56              | 1707          | North-Amer        | main         | VI             |
| USA     | District of Columbia | *  | 520                  | 28.2               | 13              | 1322          | North-Amer        | main         | VI             |
| USA     | Florida              | *  | 1473                 | 30.0               | 167             | 3440          | North-Amer        | main         | V              |
| USA     | Georgia              | *  | 945                  | 22.9               | 79              | 3181          | North-Amer        | main         | VI             |
| USA     | Idaho                | *  | 615                  | 19.7               | 54              | 2500          | North-Amer        | main         | VII            |
| USA     | Illinois             | *  | 1050                 | 30.8               | 62              | 2355          | North-Amer        | main         | VI             |
| USA     | Indiana              | *  | 813                  | 27.7               | 57              | 2120          | North-Amer        | main         | VI             |
| USA     | Iowa                 | *  | 624                  | 27.0               | 55              | 1691          | North-Amer        | main         | VI             |
| USA     | Kansas               | *  | 543                  | 23.2               | 66              | 1794          | North-Amer        | main         | VI             |
| USA     | Kentucky             | *  | 839                  | 28.1               | 62              | 2143          | North-Amer        | main         | VI             |
| USA     | Louisiana            | *  | 927                  | 27.4               | 87              | 2451          | North-Amer        | main         | VI             |
| USA     | Maine                | *  | 889                  | 34.5               | 52              | 1686          | North-Amer        | main         | VI             |
| USA     | Maryland             | *  | 1176                 | 33.4               | 66              | 2343          | North-Amer        | main         | VI             |
| USA     | Massachusetts        | *  | 1496                 | 42.6               | 80              | 2015          | North-Amer        | main         | VI             |
| USA     | Michigan             | *  | 1082                 | 33.8               | 82              | 2120          | North-Amer        | main         | VI             |
| USA     | Minnesota            | *  | 613                  | 25.2               | 67              | 1819          | North-Amer        | main         | VI             |
| USA     | Mississippi          | *  | 795                  | 24.0               | 80              | 2516          | North-Amer        | main         | VI             |
| USA     | Missouri             | *  | 891                  | 29.4               | 61              | 2139          | North-Amer        | main         | VI             |
| USA     | Montana              | *  | 584                  | 20.5               | 66              | 2269          | North-Amer        | main         | VII            |
| USA     | Nebraska             | *  | 486                  | 23.8               | 51              | 1555          | North-Amer        | main         | VI             |
| USA     | Nevada               | *  | 431                  | 12.8               | 73              | 2947          | North-Amer        | main         | VII            |
| USA     | New Hampshire        | *  | 678                  | 29.5               | 64              | 1621          | North-Amer        | main         | VI             |
| USA     | New Jersey           | *  | 1174                 | 35.4               | 73              | 2145          | North-Amer        | main         | VI             |

| Country   | Subregion              | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|-----------|------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| USA       | New Mexico             | *  | 558                  | 13.7               | 70              | 3514          | North-Amer        | main         | III            |
| USA       | New York               | *  | 1598                 | 39.8               | 70              | 2421          | North-Amer        | main         | VI             |
| USA       | North Carolina         | *  | 1106                 | 27.2               | 89              | 2963          | North-Amer        | main         | VI             |
| USA       | North Dakota           | *  | 340                  | 22.8               | 36              | 1152          | North-Amer        | main         | VI             |
| USA       | Ohio                   | *  | 1137                 | 34.7               | 64              | 2135          | North-Amer        | main         | VI             |
| USA       | Oklahoma               | *  | 558                  | 18.4               | 62              | 2477          | North-Amer        | main         | VI             |
| USA       | Oregon                 | *  | 1118                 | 25.4               | 93              | 3288          | North-Amer        | main         | VI             |
| USA       | Pennsylvania           | *  | 1404                 | 37.6               | 83              | 2332          | North-Amer        | main         | VI             |
| USA       | Rhode Island           | *  | 695                  | 19.5               | 45              | 2877          | North-Amer        | main         | VI             |
| USA       | South Carolina         | *  | 968                  | 25.6               | 76              | 2810          | North-Amer        | main         | VI             |
| USA       | South Dakota           | *  | 367                  | 19.3               | 46              | 1532          | North-Amer        | main         | VI             |
| USA       | Tennessee              | *  | 725                  | 23.1               | 83              | 2415          | North-Amer        | main         | VI             |
| USA       | Texas                  | *  | 1025                 | 17.9               | 137             | 4689          | North-Amer        | main         | III            |
| USA       | Utah                   | *  | 644                  | 17.5               | 59              | 3043          | North-Amer        | main         | VII            |
| USA       | Vermont                | *  | 780                  | 32.5               | 62              | 1619          | North-Amer        | main         | VI             |
| USA       | Virginia               | *  | 1065                 | 28.3               | 87              | 2704          | North-Amer        | main         | VI             |
| USA       | Washington             | *  | 1083                 | 29.2               | 140             | 2624          | North-Amer        | main         | VI             |
| USA       | Washington DC          | *  | 551                  | 29.4               | 8               | 1321          | North-Amer        | main         | VI             |
| USA       | West Virginia          | *  | 774                  | 28.5               | 56              | 1946          | North-Amer        | main         | VI             |
| USA       | Wisconsin              | *  | 857                  | 30.8               | 56              | 1926          | North-Amer        | main         | VI             |
| USA       | Wyoming                | *  | 418                  | 15.4               | 43              | 2297          | North-Amer        | main         | VII            |
| Argentina |                        |    | 553                  | 7.6                | 53              | 6716          | South-Amer        | main         | several        |
| Argentina | Buenos Aires           | *  | 413                  | 15.6               |                 | 2241          | South-Amer        | main         | V              |
| Argentina | Catamarca              | *  | 83                   | 3.9                |                 | 2065          | South-Amer        | main         | I              |
| Argentina | Ciudad de Buenos Aires | *  | 101                  | 20.0               |                 | 403           | South-Amer        | main         | VII            |
| Argentina | Cordoba                | *  | 195                  | 9.2                |                 | 1929          | South-Amer        | main         | I              |
| Argentina | Corrientes             | *  | 100                  | 3.3                |                 | 2907          | South-Amer        | main         | I              |
| Argentina | Entre Rios             | *  | 199                  | 8.5                |                 | 2149          | South-Amer        | main         | I              |
| Argentina | Formosa                | *  | 43                   | 2.6                |                 | 1599          | South-Amer        | main         | I              |
| Argentina | Chaco                  | *  | 60                   | 3.2                |                 | 1802          | South-Amer        | main         | I              |
| Argentina | Chubut                 | *  | 165                  | 10.9               |                 | 1345          | South-Amer        | main         | VII            |
| Argentina | Jujuy                  | *  | 103                  | 3.3                |                 | 3045          | South-Amer        | main         | I              |
| Argentina | La Pampa               | *  | 177                  | 14.9               |                 | 1010          | South-Amer        | main         | III            |
| Argentina | La Rioja               | *  | 68                   | 4.5                |                 | 1450          | South-Amer        | main         | I              |
| Argentina | Mendoza                | *  | 186                  | 9.7                |                 | 1738          | South-Amer        | main         | III            |
| Argentina | Misiones               | *  | 78                   | 2.4                |                 | 3166          | South-Amer        | main         | I              |
| Argentina | Neuquen                | *  | 186                  | 9.9                |                 | 1691          | South-Amer        | main         | VII            |
| Argentina | Rio Negro              | *  | 220                  | 11.6               |                 | 1677          | South-Amer        | main         | VII            |
| Argentina | Salta                  | *  | 134                  | 3.8                |                 | 3432          | South-Amer        | main         | I              |
| Argentina | San Juan               | *  | 89                   | 6.1                |                 | 1364          | South-Amer        | main         | III            |
| Argentina | San Luis               | *  | 93                   | 7.8                |                 | 1097          | South-Amer        | main         | III            |
| Argentina | Santa Cruz             | *  | 129                  | 11.1               |                 | 1037          | South-Amer        | main         | VII            |
| Argentina | Santa Fe               | *  | 111                  | 5.9                |                 | 1783          | South-Amer        | main         | I              |
| Argentina | Santiago del Estero    | *  | 68                   | 6.7                |                 | 953           | South-Amer        | main         | I              |
| Argentina | Tucuman                | *  | 130                  | 4.7                |                 | 2662          | South-Amer        | main         | I              |
| Belize    |                        | *  | 107                  | 2.6                | 11              | 4000          | South-Amer        | main         | I              |
| Bolivia   |                        | *  | 198                  | 1.1                | 89              | 17367         | South-Amer        | main         | II             |
| Brazil    | Acre                   | *  | 75                   | 1.9                | 4               | 3928          | South-Amer        | main         | I              |
| Brazil    | Alagoas                | *  | 72                   | 5.3                | 7               | 1288          | South-Amer        | main         | I              |
| Brazil    | Amap                   | *  | 56                   | 2.4                | 3               | 2302          | South-Amer        | main         | I              |
| Brazil    | Amazonas               | *  | 111                  | 1.4                | 5               | 7585          | South-Amer        | main         | I              |
| Brazil    | Bahia                  | *  | 179                  | 2.1                | 13              | 8237          | South-Amer        | main         | II             |
| Brazil    | Cear                   | *  | 108                  | 5.1                | 9               | 2025          | South-Amer        | main         | II             |
| Brazil    | Distrito Federal       | *  | 130                  | 4.4                |                 | 2827          | South-Amer        | main         | II             |
| Brazil    | Espirito Santo         | *  | 102                  | 2.2                | 17              | 4490          | South-Amer        | main         | I              |



| Country       | Subregion           | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|---------------|---------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Brazil        | Goiás               | *  | 127                  | 2.4                | 7               | 5115          | South-Amer        | main         | II             |
| Brazil        | Maranhao            | *  | 82                   | 3.2                | 10              | 2495          | South-Amer        | main         | II             |
| Brazil        | Mato Grosso         | *  | 113                  | 2.2                | 7               | 4937          | South-Amer        | main         | I              |
| Brazil        | Mato Grosso do Sul  | *  | 112                  | 3.6                | 14              | 3012          | South-Amer        | main         | II             |
| Brazil        | Minas Gerais        | *  | 226                  | 2.1                | 19              | 10710         | South-Amer        | main         | II             |
| Brazil        | Par                 | *  | 111                  | 1.9                | 6               | 5839          | South-Amer        | main         | I              |
| Brazil        | Paraíba             | *  | 102                  | 6.9                | 9               | 1378          | South-Amer        | main         | II             |
| Brazil        | Paraná              | *  | 238                  | 4.0                | 26              | 5685          | South-Amer        | main         | V              |
| Brazil        | Pernambuco          | *  | 139                  | 4.9                | 18              | 2699          | South-Amer        | main         | II             |
| Brazil        | Piauí               | *  | 72                   | 4.6                | 7               | 1490          | South-Amer        | main         | II             |
| Brazil        | Rio de Janeiro      | *  | 207                  | 2.8                | 17              | 7280          | South-Amer        | main         | I              |
| Brazil        | Rio Grande do Norte | *  | 70                   | 8.4                | 9               | 760           | South-Amer        | main         | II             |
| Brazil        | Rio Grande do Sul   | *  | 229                  | 5.5                | 18              | 3916          | South-Amer        | main         | V              |
| Brazil        | Rondonia            | *  | 32                   | 1.2                | 3               | 2725          | South-Amer        | main         | I              |
| Brazil        | Roraima             | *  | 42                   | 1.7                |                 | 2403          | South-Amer        | main         | I              |
| Brazil        | Santa Catarina      | *  | 230                  | 4.9                | 18              | 4491          | South-Amer        | main         | V              |
| Brazil        | São Paulo           | *  | 315                  | 4.1                | 22              | 7386          | South-Amer        | main         | V              |
| Brazil        | Sergipe             | *  | 46                   | 4.9                | 6               | 888           | South-Amer        | main         | I              |
| Brazil        | Tocantins           | *  | 35                   | 2.2                | 2               | 1566          | South-Amer        | main         | II             |
| Colombia      |                     | *  | 296                  | 0.6                | 72              | 51220         | South-Amer        | main         | I              |
| Costa Rica    |                     | *  | 280                  | 2.3                | 47              | 12119         | South-Amer        | main         | I              |
| Ecuador       |                     | *  | 595                  | 3.0                | 12              | 19362         | South-Amer        | main         | I              |
| El Salvador   |                     |    |                      |                    | 4               | 2911          | South-Amer        | main         | I              |
| French Guiana |                     | *  | 162                  | 2.7                | 5               | 5750          | South-Amer        | main         | I              |
| Guatemala     |                     |    |                      |                    | 10              | 7754          | South-Amer        | main         | I              |
| Guyana        |                     | *  | 113                  | 1.7                | 52              | 6409          | South-Amer        | main         | I              |
| Honduras      |                     |    |                      |                    | 10              | 6166          | South-Amer        | main         | I              |
| Chile         |                     |    | 743                  | 12.2               | 50              | 5364          | South-Amer        | main         | several        |
| Chile         | Aisen               | *  | 54                   | 22.9               |                 | 182           | South-Amer        | main         | VI             |
| Chile         | Antártica Chilena   | *  | 9                    | 10.5               |                 | 77            | South-Amer        | main         | IX             |
| Chile         | Arauco              | *  | 96                   | 24.1               |                 | 302           | South-Amer        | main         | IV             |
| Chile         | Arica               | *  | 84                   | 34.0               |                 | 163           | South-Amer        | main         | III            |
| Chile         | Bío Bío province    | *  | 139                  | 22.5               |                 | 479           | South-Amer        | main         | IV             |
| Chile         | Bío Bío region      |    | 413                  | 20.5               |                 | 1599          | South-Amer        | main         | IV             |
| Chile         | Cachapoal           | *  | 61                   | 28.5               |                 | 153           | South-Amer        | main         | IV             |
| Chile         | Capitán Prat        | *  | 3                    | 7.1                |                 | 39            | South-Amer        | main         | VI             |
| Chile         | Cardenal Caro       | *  | 57                   | 36.3               |                 | 100           | South-Amer        | main         | IV             |
| Chile         | Cauquenes           | *  | 81                   | 35.7               |                 | 146           | South-Amer        | main         | IV             |
| Chile         | Cautín              | *  | 250                  | 36.0               |                 | 445           | South-Amer        | main         | IV             |
| Chile         | Coihaique           | *  | 6                    | 3.7                |                 | 157           | South-Amer        | main         | VI             |
| Chile         | Colchagua           | *  | 100                  | 25.7               |                 | 289           | South-Amer        | main         | IV             |
| Chile         | Concepción          | *  | 229                  | 41.3               |                 | 326           | South-Amer        | main         | IV             |
| Chile         | Copiapó             | *  | 54                   | 21.3               |                 | 200           | South-Amer        | main         | III            |
| Chile         | Coquimbo            |    | 257                  | 20.3               |                 | 1012          | South-Amer        | main         | III            |
| Chile         | Cordillera          | *  | 46                   | 11.1               |                 | 370           | South-Amer        | main         | IV             |
| Chile         | Curico              | *  | 156                  | 33.6               |                 | 308           | South-Amer        | main         | IV             |
| Chile         | El Loa              | *  | 45                   | 15.8               |                 | 240           | South-Amer        | main         | III            |
| Chile         | Elqui               | *  | 85                   | 21.1               |                 | 318           | South-Amer        | main         | III            |
| Chile         | General Carrera     | *  | 6                    | 3.6                |                 | 163           | South-Amer        | main         | VI             |
| Chile         | Huasco              | *  | 84                   | 25.2               |                 | 249           | South-Amer        | main         | III            |
| Chile         | Chacabuco           | *  | 23                   | 11.2               |                 | 182           | South-Amer        | main         | IV             |
| Chile         | Chaparral           | *  | 8                    | 8.6                |                 | 85            | South-Amer        | main         | III            |
| Chile         | Chiloé              | *  | 150                  | 42.4               |                 | 204           | South-Amer        | main         | VI             |
| Chile         | Choapa              | *  | 91                   | 24.5               |                 | 280           | South-Amer        | main         | III            |
| Chile         | Iquique             | *  | 41                   | 63.1               |                 | 24            | South-Amer        | main         | III            |

| Country       | Subregion                   | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|---------------|-----------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Chile         | Libertador General Bernardo |    | 278                  | 33.9               |                 | 542           | South-Amer        | main         | IV             |
|               | O'Higgins                   |    |                      |                    |                 |               |                   |              |                |
| Chile         | Limari                      | *  | 111                  | 21.1               |                 | 414           | South-Amer        | main         | III            |
| Chile         | Linares                     | *  | 139                  | 33.7               |                 | 274           | South-Amer        | main         | IV             |
| Chile         | Llanquihue                  | *  | 93                   | 26.1               |                 | 263           | South-Amer        | main         | VI             |
| Chile         | Los Andes                   | *  | 83                   | 25.7               |                 | 240           | South-Amer        | main         | IV             |
| Chile         | Magallanes                  | *  | 104                  | 29.4               |                 | 250           | South-Amer        | main         | VIII           |
| Chile         | Maipo                       | *  | 24                   | 19.5               |                 | 99            | South-Amer        | main         | IV             |
| Chile         | Malleco                     | *  | 198                  | 26.7               |                 | 543           | South-Amer        | main         | IV             |
| Chile         | Maule                       |    | 327                  | 23.1               |                 | 1089          | South-Amer        | main         | IV             |
| Chile         | Melipilla                   | *  | 4                    | 4.7                |                 | 82            | South-Amer        | main         | IV             |
| Chile         | Nuble                       | *  | 204                  | 29.3               |                 | 492           | South-Amer        | main         | IV             |
| Chile         | Osorno                      | *  | 128                  | 30.5               |                 | 292           | South-Amer        | main         | VI             |
| Chile         | Palena                      | *  | 4                    | 2.7                |                 | 145           | South-Amer        | main         | VI             |
| Chile         | Parinacota                  | *  | 9                    | 3.4                |                 | 258           | South-Amer        | main         | III            |
| Chile         | Petorca                     | *  | 78                   | 40.2               |                 | 116           | South-Amer        | main         | IV             |
| Chile         | Quillota                    | *  | 166                  | 39.5               |                 | 254           | South-Amer        | main         | IV             |
| Chile         | San Antonio                 | *  | 129                  | 60.8               |                 | 83            | South-Amer        | main         | IV             |
| Chile         | San Felipe de Aconcagua     | *  | 73                   | 38.6               |                 | 116           | South-Amer        | main         | IV             |
| Chile         | Santiago                    | *  | 290                  | 42.3               |                 | 396           | South-Amer        | main         | IV             |
| Chile         | Santiago Metropolitan       |    | 379                  | 24.6               |                 | 1160          | South-Amer        | main         | IV             |
| Chile         | Talagante                   | *  | 9                    | 22.5               |                 | 31            | South-Amer        | main         | IV             |
| Chile         | Talca                       | *  | 151                  | 29.5               |                 | 361           | South-Amer        | main         | IV             |
| Chile         | Tocopilla                   | *  | 11                   | 21.6               |                 | 40            | South-Amer        | main         | III            |
| Chile         | Ultima Esperanza            | *  | 88                   | 19.1               |                 | 373           | South-Amer        | main         | VIII           |
| Chile         | Valdivia                    | *  | 216                  | 36.2               |                 | 380           | South-Amer        | main         | VI             |
| Chile         | Valparaiso province         | *  | 239                  | 48.5               |                 | 254           | South-Amer        | main         | IV             |
| Chile         | Valparaiso region           |    | 369                  | 25.8               |                 | 1063          | South-Amer        | main         | IV             |
| Mexico        | Distrito Federal            | *  | 190                  | 9.9                |                 | 1722          | South-Amer        | main         | III            |
| Nicaragua     |                             | *  | 671                  | 10.4               | 7               | 5796          | South-Amer        | main         | I              |
| Panama        |                             | *  | 263                  | 2.8                | 8               | 9147          | South-Amer        | main         | I              |
| Paraguay      |                             |    | 173                  | 3.0                | 20              | 5521          | South-Amer        | main         | II             |
| Peru          |                             | *  | 360                  | 2.0                | 29              | 17900         | South-Amer        | main         | I              |
| Suriname      |                             | *  | 116                  | 2.3                | 28              | 5018          | South-Amer        | main         | I              |
| Uruguay       |                             | *  | 378                  | 14.4               | 65              | 2253          | South-Amer        | main         | V              |
| Venezuela     |                             | *  | 101                  | 0.6                | 36              | 15820         | South-Amer        | main         | I              |
| Cape Verde    |                             | *  | 740                  | 49.4               | 5               | 757           | Africa            | isl          | II             |
| Cape Verde    | Boavista                    |    | 91                   | 49.2               |                 | 94            | Africa            | isl          | II             |
| Cape Verde    | Branco                      |    | 19                   | 32.2               |                 | 40            | Africa            | isl          | II             |
| Cape Verde    | Brava                       |    | 148                  | 61.7               |                 | 92            | Africa            | isl          | II             |
| Cape Verde    | Fogo                        |    | 223                  | 61.8               |                 | 138           | Africa            | isl          | II             |
| Cape Verde    | Maio                        |    | 115                  | 57.8               |                 | 84            | Africa            | isl          | II             |
| Cape Verde    | Raso                        |    | 19                   | 28.4               |                 | 48            | Africa            | isl          | II             |
| Cape Verde    | Sal                         |    | 54                   | 42.9               |                 | 72            | Africa            | isl          | II             |
| Cape Verde    | Santa Luzia                 |    | 28                   | 37.3               |                 | 47            | Africa            | isl          | II             |
| Cape Verde    | Santiago                    |    | 294                  | 65.9               |                 | 152           | Africa            | isl          | II             |
| Cape Verde    | Santo Antao                 |    | 294                  | 62.6               |                 | 176           | Africa            | isl          | II             |
| Cape Verde    | Sao Nicolau                 |    | 170                  | 56.5               |                 | 131           | Africa            | isl          | II             |
| Cape Verde    | Sao Vicente                 |    | 149                  | 54.0               |                 | 127           | Africa            | isl          | II             |
| Comoros       |                             | *  | 100                  |                    | 65              |               | Africa            | isl          | I              |
| France        | La Reunion                  |    | 628                  | 40.7               | 71              | 915           | Africa            | isl          | II             |
| Great Britain | Ascension Island            | *  | 157                  | 86.3               | 1               | 25            | Africa            | isl          | II             |
| Great Britain | Diego Garcia                | *  | 130                  | 78.3               |                 | 36            | Africa            | isl          | I              |
| Great Britain | St Helena                   | *  | 252                  | 80.8               | 8               | 60            | Africa            | isl          | II             |
| Guinea Bissau | Bijagos                     |    | 15                   |                    |                 |               | Africa            | isl          | I              |

| Country                  | Subregion              | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|--------------------------|------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Madagascar               |                        | *  | 517                  | 4.1                | 101             | 12000         | Africa            | isl          | II             |
| Mauritius                |                        | *  | 731                  | 45.2               | 61              | 887           | Africa            | isl          | II             |
| Mauritius                | Rodrigues              |    | 305                  | 66.4               | 11              | 154           | Africa            | isl          | II             |
| Portugal                 | Azores                 | *  | 760                  | 41.2               | 16              | 1086          | Africa            | isl          | VI             |
| Portugal                 | Desertas               | *  | 13                   | 6.7                |                 | 182           | Africa            | isl          | V              |
| Portugal                 | Madeira                | *  | 789                  | 54.8               | 13              | 650           | Africa            | isl          | V              |
| Portugal                 | Porto Santo            | *  | 92                   | 21.8               |                 | 330           | Africa            | isl          | V              |
| Portugal                 | Salvage Islands        | *  | 15                   | 15.6               |                 | 81            | Africa            | isl          | V              |
| Sao Tome and Principe    |                        | *  | 314                  | 28.1               | 1               | 803           | Africa            | isl          | I              |
| Sao Tome<br>and Principe | Principe               |    | 19                   | 6.0                |                 | 300           | Africa            | isl          | I              |
| Sao Tome<br>and Principe | Sao Tome               |    | 30                   | 4.1                |                 | 700           | Africa            | isl          | I              |
| Seychelles               |                        |    | 165                  | 42.6               | 21              | 222           | Africa            | isl          | II             |
| Seychelles               | African Banks          | *  | 2                    | 13.3               |                 | 13            | Africa            | isl          | I              |
| Seychelles               | Aldabra                | *  | 53                   | 19.9               | 1               | 214           | Africa            | isl          | I              |
| Seychelles               | Alphonse               | *  | 27                   | 40.3               |                 | 40            | Africa            | isl          | I              |
| Seychelles               | Aride                  | *  | 40                   | 41.7               |                 | 56            | Africa            | isl          | I              |
| Seychelles               | Assumption             | *  | 35                   | 23.3               |                 | 115           | Africa            | isl          | I              |
| Seychelles               | Astove                 | *  | 32                   | 22.5               |                 | 110           | Africa            | isl          | I              |
| Seychelles               | Bird                   | *  | 88                   | 57.9               |                 | 64            | Africa            | isl          | I              |
| Seychelles               | Booby Island           | *  | 1                    | 10.0               |                 | 9             | Africa            | isl          | I              |
| Seychelles               | Cocos                  | *  | 2                    | 22.2               |                 | 7             | Africa            | isl          | I              |
| Seychelles               | Coetivy                | *  | 54                   | 50.5               |                 | 53            | Africa            | isl          | I              |
| Seychelles               | Conception             | *  | 37                   | 39.8               |                 | 56            | Africa            | isl          | I              |
| Seychelles               | Cosmoledo              | *  | 26                   | 19.5               |                 | 107           | Africa            | isl          | I              |
| Seychelles               | Cousin                 | *  | 79                   | 53.0               |                 | 70            | Africa            | isl          | I              |
| Seychelles               | Cousine                | *  | 3                    | 17.6               |                 | 14            | Africa            | isl          | I              |
| Seychelles               | Curieuse               | *  | 124                  | 50.2               |                 | 123           | Africa            | isl          | I              |
| Seychelles               | Darros                 | *  | 52                   | 49.5               |                 | 53            | Africa            | isl          | I              |
| Seychelles               | Denis                  | *  | 114                  | 60.6               |                 | 74            | Africa            | isl          | I              |
| Seychelles               | Desnoefs               | *  | 15                   | 51.7               |                 | 14            | Africa            | isl          | I              |
| Seychelles               | Desroches              | *  | 26                   | 38.8               |                 | 41            | Africa            | isl          | I              |
| Seychelles               | Farquhar               | *  | 39                   | 47.6               |                 | 43            | Africa            | isl          | I              |
| Seychelles               | Felicite               | *  | 81                   | 39.9               |                 | 122           | Africa            | isl          | I              |
| Seychelles               | Fregate                | *  | 100                  | 48.1               |                 | 108           | Africa            | isl          | I              |
| Seychelles               | Grande Soeur           | *  | 63                   | 50.8               |                 | 61            | Africa            | isl          | I              |
| Seychelles               | Ile Anonyme            | *  | 34                   | 54.8               |                 | 28            | Africa            | isl          | I              |
| Seychelles               | Ile au Cerf            | *  | 27                   | 50.9               |                 | 26            | Africa            | isl          | I              |
| Seychelles               | Ile aux Vaches Marines | *  | 2                    | 11.8               |                 | 15            | Africa            | isl          | I              |
| Seychelles               | Ile Longue             | *  | 21                   | 32.3               |                 | 44            | Africa            | isl          | I              |
| Seychelles               | Ile St Anne            | *  | 67                   | 59.8               |                 | 45            | Africa            | isl          | I              |
| Seychelles               | La Digue               | *  | 77                   | 52.7               |                 | 69            | Africa            | isl          | I              |
| Seychelles               | Mahe                   | *  | 287                  | 46.1               |                 | 336           | Africa            | isl          | I              |
| Seychelles               | Marianne               | *  | 77                   | 51.3               |                 | 73            | Africa            | isl          | I              |
| Seychelles               | Marie-Louise           | *  | 29                   | 50.9               |                 | 28            | Africa            | isl          | I              |
| Seychelles               | North Island           | *  | 125                  | 56.1               |                 | 98            | Africa            | isl          | I              |
| Seychelles               | Petit Soeur            | *  | 2                    | 11.8               |                 | 15            | Africa            | isl          | I              |
| Seychelles               | Platte                 | *  | 20                   | 39.2               |                 | 31            | Africa            | isl          | I              |
| Seychelles               | Poivre                 | *  | 39                   | 52.0               |                 | 36            | Africa            | isl          | I              |
| Seychelles               | Praslin                | *  | 104                  | 35.7               |                 | 187           | Africa            | isl          | I              |
| Seychelles               | Providence             | *  | 7                    | 33.3               |                 | 14            | Africa            | isl          | I              |
| Seychelles               | Recifs                 | *  | 2                    | 16.7               |                 | 10            | Africa            | isl          | I              |
| Seychelles               | Remire                 | *  | 25                   | 41.7               |                 | 35            | Africa            | isl          | I              |
| Seychelles               | Silhouette             | *  | 131                  | 32.8               |                 | 269           | Africa            | isl          | I              |

| Country       | Subregion                               | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|---------------|-----------------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Seychelles    | St Francois                             | *  | 4                    | 22.2               |                 | 14            | Africa            | isl          | I              |
| Seychelles    | St Joseph                               | *  | 16                   | 34.0               |                 | 31            | Africa            | isl          | I              |
| Seychelles    | St Pierre                               | *  | 10                   | 33.3               |                 | 20            | Africa            | isl          | I              |
| Seychelles    | Therese                                 | *  | 84                   | 47.2               |                 | 94            | Africa            | isl          | I              |
| South Africa  | Dassen                                  |    | 15                   | 48.4               |                 | 16            | Africa            | isl          | IV             |
| South Africa  | Jutten                                  |    | 12                   | 63.2               |                 | 7             | Africa            | isl          | IV             |
| South Africa  | Meeu                                    |    | 8                    | 29.6               |                 | 19            | Africa            | isl          | IV             |
| South Africa  | Robben                                  |    | 38                   | 27.3               |                 | 101           | Africa            | isl          | IV             |
| South Africa  | Schappen                                |    | 5                    | 29.4               |                 | 12            | Africa            | isl          | IV             |
| Spain         | Canary Islands                          | *  | 548                  | 29.7               | 14              | 1300          | Africa            | isl          | II             |
| Australia     | Macquarie Island                        | *  | 3                    | 6.4                | 1               | 44            | Antarctica        | isl          | IX             |
| France        | Amsterdam Island                        |    | 17                   | 48.6               |                 | 18            | Antarctica        | isl          | VI             |
| France        | Crozet Islands                          | *  | 59                   | 74.7               | 7               | 20            | Antarctica        | isl          | VI             |
| France        | Kerguelen Islands                       | *  | 67                   | 69.1               | 7               | 30            | Antarctica        | isl          | IX             |
| Great Britain | Falkland Islands                        |    | 83                   | 33.7               | 4               | 163           | Antarctica        | isl          | VIII           |
| Great Britain | Gough Island                            | *  | 12                   | 17.6               |                 | 56            | Antarctica        | isl          | VI             |
| Great Britain | Heard Island                            | *  | 1                    | 8.3                | 0               | 11            | Antarctica        | isl          | IX             |
| Great Britain | Inaccessible Island                     | *  | 19                   | 26.8               |                 | 52            | Antarctica        | isl          | II             |
| Great Britain | Nightingale                             | *  | 5                    | 14.3               |                 | 30            | Antarctica        | isl          | II             |
| Great Britain | South Georgia Island                    | *  | 31                   | 54.4               | 1               | 26            | Antarctica        | isl          | IX             |
| Great Britain | Tristan da Cunha                        | *  | 82                   | 56.9               |                 | 62            | Antarctica        | isl          | II             |
| South Africa  | Marion Island                           | *  | 12                   | 34.3               |                 | 23            | Antarctica        | isl          | VI             |
| South Africa  | Prince Edward Island                    | *  | 3                    | 12.5               | 0               | 21            | Antarctica        | isl          | VI             |
| Cyprus        |                                         | *  | 143                  | 7.6                | 16              | 1738          | Asia-temp         | isl          | IV             |
| China         | Hainan                                  | *  | 244                  | 7.4                | 66              | 3046          | Asia-temp         | isl          | V              |
| Iran          | Hormuz and Qeshm                        |    | 49                   | 17.6               |                 | 230           | Asia-temp         | isl          | III            |
| Japan         |                                         | *  | 1311                 | 22.6               | 163             | 4490          | Asia-temp         | isl          | V              |
| Russia        | Antsiferova, Kuril Islands              | *  | 1                    | 5.6                |                 | 17            | Asia-temp         | isl          | VIII           |
| Russia        | Anuchina, Kuril Islands                 | *  | 16                   | 16.7               |                 | 80            | Asia-temp         | isl          | VIII           |
| Russia        | Demina, Kuril Islands                   | *  | 2                    | 4.9                |                 | 39            | Asia-temp         | isl          | VIII           |
| Russia        | Ekarma, Kuril Islands                   | *  | 2                    | 4.2                |                 | 46            | Asia-temp         | isl          | VIII           |
| Russia        | Iturup, Kuril Islands                   | *  | 19                   | 3.4                |                 | 535           | Asia-temp         | isl          | VIII           |
| Russia        | Ketoi, Kuril Islands                    | *  | 1                    | 0.5                |                 | 219           | Asia-temp         | isl          | VIII           |
| Russia        | Kharimkotan, Kuril Islands              | *  | 2                    | 1.1                |                 | 177           | Asia-temp         | isl          | VIII           |
| Russia        | Kunashir, Kuril Islands                 | *  | 24                   | 3.7                |                 | 619           | Asia-temp         | isl          | VIII           |
| Russia        | Makanrushi, Kuril Islands               | *  | 2                    | 1.9                |                 | 106           | Asia-temp         | isl          | VIII           |
| Russia        | Matua, Kuril Islands                    | *  | 3                    | 2.2                |                 | 131           | Asia-temp         | isl          | VIII           |
| Russia        | Novaya Zemlya                           |    | 2                    | 1.2                |                 | 171           | Asia-temp         | isl          | IX             |
| Russia        | Paramushir, Kuril Islands               | *  | 3                    | 0.9                |                 | 334           | Asia-temp         | isl          | VIII           |
| Russia        | Polonskogo, Kuril Islands               | *  | 10                   | 7.9                |                 | 117           | Asia-temp         | isl          | VIII           |
| Russia        | Sakhalin                                |    | 92                   | 10.4               |                 | 795           | Asia-temp         | isl          | VIII           |
| Russia        | Shikotan, Kuril Islands                 | *  | 19                   | 3.7                |                 | 499           | Asia-temp         | isl          | VIII           |
| Russia        | Shimushir, Kuril Islands                | *  | 8                    | 3.2                |                 | 240           | Asia-temp         | isl          | VIII           |
| Russia        | Shumushu, Kuril Islands                 | *  | 2                    | 0.8                |                 | 261           | Asia-temp         | isl          | VIII           |
| Russia        | Storozhevoy, Kuril Islands              | *  | 3                    | 21.4               |                 | 11            | Asia-temp         | isl          | VIII           |
| Russia        | Tanfilyeva, Kuril Islands               | *  | 20                   | 11.9               |                 | 148           | Asia-temp         | isl          | VIII           |
| Russia        | Urup, Kuril Islands                     | *  | 1                    | 0.3                |                 | 304           | Asia-temp         | isl          | VIII           |
| Russia        | Ushishir, Kuril Islands                 | *  | 1                    | 1.0                |                 | 103           | Asia-temp         | isl          | VIII           |
| Russia        | Yuri, Kuril Islands                     | *  | 16                   | 8.8                |                 | 165           | Asia-temp         | isl          | VIII           |
| Russia        | Zeleny, Kuril Islands                   | *  | 22                   | 12.4               |                 | 156           | Asia-temp         | isl          | VIII           |
| Taiwan        |                                         | *  | 607                  | 13.5               | 54              | 3875          | Asia-temp         | isl          | V              |
| Australia     | Cocos (Keeling) Main Atoll              | *  | 56                   | 46.3               | 6               | 65            | Asia-trop         | isl          | I              |
| Australia     | Cocos (Keeling) North<br>Keeling Island | *  | 6                    | 15.4               |                 | 33            | Asia-trop         | isl          | I              |
| Australia     | Christmas Island                        | *  | 176                  | 45.7               | 28              | 209           | Asia-trop         | isl          | I              |

| Country          | Subregion                              | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|------------------|----------------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Brunei           |                                        |    |                      |                    | 7               | 6000          | Asia-trop         | isl          | I              |
| India            | Andaman and Nicobar                    | *  | 33                   | 1.4                | 5               | 2270          | Asia-trop         | isl          | I              |
| India            | Lakshadweep                            | *  | 28                   | 7.4                | 1               | 348           | Asia-trop         | isl          | I              |
| Indonesia        |                                        | *  | 503                  | 1.7                | 50              | 29375         | Asia-trop         | isl          | I              |
| Indonesia        | Kalimantan                             |    |                      |                    | 7               | 900           | Asia-trop         | isl          | I              |
| Indonesia        | Maluku                                 |    |                      |                    | 5               | 380           | Asia-trop         | isl          | I              |
| Indonesia        | Sulawesi                               |    |                      |                    | 6               | 520           | Asia-trop         | isl          | I              |
| Indonesia        | Sumatra                                |    |                      |                    | 10              | 820           | Asia-trop         | isl          | I              |
| Maldives         |                                        |    |                      |                    | 4               | 277           | Asia-trop         | isl          | I              |
| Papua New Guinea |                                        |    |                      |                    | 50              | 11544         | Asia-trop         | isl          | I              |
| Philippines      |                                        | *  | 628                  | 6.4                | 49              | 9200          | Asia-trop         | isl          | I              |
| Singapore        |                                        | *  | 221                  | 9.3                | 68              | 2156          | Asia-trop         | isl          | I              |
| Solomon Islands  |                                        |    | 200                  | 5.9                | 27              | 3200          | Asia-trop         | isl          | I              |
| Sri Lanka        |                                        | *  | 365                  | 9.8                | 30              | 3368          | Asia-trop         | isl          | I              |
| Australia        | Alexander Island                       | *  | 15                   | 44.1               |                 | 19            | Australasia       | isl          | IV             |
| Australia        | Ashmore Reef                           | *  | 6                    | 20.7               |                 | 23            | Australasia       | isl          | I              |
| Australia        | Beacon Island                          | *  | 14                   | 48.3               |                 | 15            | Australasia       | isl          | IV             |
| Australia        | Carnac Island                          |    | 34                   | 43.0               |                 | 45            | Australasia       | isl          | VI             |
| Australia        | Coral Sea Islands Territory            | *  | 5                    | 19.2               |                 | 21            | Australasia       | isl          | I              |
| Australia        | East Wallabi Island                    | *  | 27                   | 21.6               |                 | 98            | Australasia       | isl          | IV             |
| Australia        | Gilbert Island                         | *  | 5                    | 31.3               |                 | 11            | Australasia       | isl          | IV             |
| Australia        | Gun Island                             | *  | 11                   | 47.8               |                 | 12            | Australasia       | isl          | IV             |
| Australia        | Helms Island                           | *  | 51                   | 47.2               |                 | 57            | Australasia       | isl          | IV             |
| Australia        | Heron Island                           |    | 25                   | 48.1               |                 | 27            | Australasia       | isl          | V              |
| Australia        | Hummock Island                         | *  | 1                    | 14.3               |                 | 6             | Australasia       | isl          | IV             |
| Australia        | Christmas Island<br>(near King Island) |    | 151                  | 42.9               |                 | 201           | Australasia       | isl          | II             |
| Australia        | Kangaroo Island                        | *  | 300                  | 25.8               |                 | 865           | Australasia       | isl          | II             |
| Australia        | Leo Island                             | *  | 10                   | 34.5               |                 | 19            | Australasia       | isl          | IV             |
| Australia        | Little Rat Island                      | *  | 22                   | 51.2               |                 | 21            | Australasia       | isl          | IV             |
| Australia        | Long Island,<br>Houtman Abrolhos       | *  | 10                   | 30.3               |                 | 23            | Australasia       | isl          | IV             |
| Australia        | Lord Howe Island                       | *  | 229                  | 48.6               | 10              | 242           | Australasia       | isl          | V              |
| Australia        | Middle Island                          | *  | 7                    | 19.4               |                 | 29            | Australasia       | isl          | IV             |
| Australia        | Morley Island                          | *  | 10                   | 37.0               |                 | 17            | Australasia       | isl          | IV             |
| Australia        | Murray Island                          | *  | 2                    | 20.0               |                 | 8             | Australasia       | isl          | IV             |
| Australia        | Newman Island                          | *  | 6                    | 30.0               |                 | 14            | Australasia       | isl          | IV             |
| Australia        | North Island,<br>Houtman Abrolhos      | *  | 24                   | 31.2               |                 | 53            | Australasia       | isl          | IV             |
| Australia        | Pelsaert Island                        | *  | 19                   | 38.8               |                 | 30            | Australasia       | isl          | IV             |
| Australia        | Pigeon Island                          | *  | 26                   | 36.6               |                 | 45            | Australasia       | isl          | IV             |
| Australia        | Rat Island                             | *  | 30                   | 44.8               |                 | 37            | Australasia       | isl          | IV             |
| Australia        | Seagull Island                         | *  | 8                    | 18.6               |                 | 35            | Australasia       | isl          | IV             |
| Australia        | Serventy Island                        | *  | 13                   | 43.3               |                 | 17            | Australasia       | isl          | IV             |
| Australia        | Suomi Island                           | *  | 5                    | 27.8               |                 | 13            | Australasia       | isl          | IV             |
| Australia        | Tasmania                               | *  | 860                  | 27.8               | 50              | 2230          | Australasia       | isl          | VI             |
| Australia        | Uncle Margie Island                    | *  | 10                   | 52.6               |                 | 9             | Australasia       | isl          | IV             |
| Australia        | West Wallabi Island                    | *  | 24                   | 25.0               |                 | 72            | Australasia       | isl          | IV             |
| Australia        | White Island                           | *  | 8                    | 28.6               |                 | 20            | Australasia       | isl          | IV             |
| Australia        | Wooded Island                          | *  | 11                   | 44.0               |                 | 14            | Australasia       | isl          | IV             |
| New Zealand      |                                        | *  | 1726                 | 44.5               | 140             | 2151          | Australasia       | isl          | V              |
| New Zealand      | Auckland Islands                       | *  | 36                   | 14.9               |                 | 205           | Australasia       | isl          | VI             |
| New Zealand      | Chatham Islands                        | *  | 425                  | 50.3               |                 | 420           | Australasia       | isl          | V              |
| New Zealand      | Kermadec Island                        |    | 88                   | 43.1               | 7               | 116           | Australasia       | isl          | V              |
| New Zealand      | Norfolk Island                         | *  | 271                  | 61.3               | 44              | 171           | Australasia       | isl          | II             |

| Country                        | Subregion                                         | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|--------------------------------|---------------------------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Faroe Islands                  |                                                   | *  | 28                   | 8.3                | 3               | 310           | Europe            | isl          | VIII           |
| France                         | Corsica                                           | *  | 397                  | 15.5               | 7               | 2160          | Europe            | isl          | IV             |
| Great Britain                  | England                                           | *  | 1379                 | 47.0               | 30              | 1552          | Europe            | isl          | VI             |
| Great Britain                  | Isle of Man                                       | *  | 798                  | 56.0               |                 | 627           | Europe            | isl          | VI             |
| Great Britain                  | Jersey and Guernsey                               | *  | 834                  | 52.2               |                 | 765           | Europe            | isl          | VI             |
| Great Britain                  | Northern Ireland                                  | *  | 389                  | 27.6               | 2               | 1022          | Europe            | isl          | VI             |
| Great Britain                  | Scotland                                          | *  | 861                  | 41.8               | 1               | 1200          | Europe            | isl          | VI             |
| Great Britain                  | Wales                                             | *  | 835                  | 43.6               | 30              | 1078          | Europe            | isl          | VI             |
| Iceland                        |                                                   |    | 59                   | 11.8               | 3               | 442           | Europe            | isl          | IX             |
| Iceland                        | Central Highlands                                 | *  | 6                    | 2.3                | 2               | 256           | Europe            | isl          | IX             |
| Iceland                        | East province                                     | *  | 42                   | 10.0               | 2               | 378           | Europe            | isl          | IX             |
| Iceland                        | North province                                    | *  | 48                   | 11.3               | 2               | 377           | Europe            | isl          | IX             |
| Iceland                        | North-west province                               | *  | 32                   | 8.4                | 2               | 347           | Europe            | isl          | IX             |
| Iceland                        | South province                                    | *  | 49                   | 12.2               | 2               | 353           | Europe            | isl          | IX             |
| Iceland                        | Surtsey                                           |    | 8                    | 29.6               |                 | 19            | Europe            | isl          | IX             |
| Iceland                        | West province                                     | *  | 51                   | 12.1               | 2               | 370           | Europe            | isl          | IX             |
| Ireland                        |                                                   | *  | 363                  | 28.3               | 77              | 921           | Europe            | isl          | VI             |
| Italy                          | Sardinia                                          | *  | 255                  | 10.8               | 56              | 2110          | Europe            | isl          | IV             |
| Italy                          | Sicily                                            | *  | 146                  | 5.5                | 14              | 2489          | Europe            | isl          | IV             |
| Italy                          | Tuscany Islands                                   |    | 93                   | 6.7                | 31              | 1300          | Europe            | isl          | IV             |
| Malta                          |                                                   | *  | 118                  |                    | 25              |               | Europe            | isl          | IV             |
| Norway                         | Jan Mayen                                         | *  | 6                    | 8.2                |                 | 67            | Europe            | isl          | IX             |
| Norway                         | Svalbard                                          | *  | 6                    | 3.2                |                 | 180           | Europe            | isl          | IX             |
| Spain                          | Balearic Islands                                  | *  | 183                  | 11.9               | 48              | 1359          | Europe            | isl          | IV             |
| Canada                         | Newfoundland                                      | *  | 415                  | 29.9               | 15              | 971           | North-Amer        | isl          | VIII           |
| Canada                         | Prince Edward Island                              | *  | 407                  | 33.4               | 18              | 813           | North-Amer        | isl          | VIII           |
| Canada                         | Sable Island                                      | *  | 79                   | 35.9               |                 | 141           | North-Amer        | isl          | VI             |
| France                         | Saint Pierre and Miquelon                         | *  | 198                  | 27.6               | 26              | 520           | North-Amer        | isl          | II             |
| Greenland                      |                                                   | *  | 145                  | 23.2               | 18              | 479           | North-Amer        | isl          | IX             |
| Mexico                         | Socorro                                           | *  | 47                   | 28.8               |                 | 116           | North-Amer        | isl          | III            |
| Cook Islands                   |                                                   |    | 401                  | 58.5               | 58              | 284           | Pacific           | isl          | I              |
| Cook Islands                   | Aitutaki                                          | *  | 184                  | 75.1               |                 | 61            | Pacific           | isl          | I              |
| Cook Islands                   | Atiu                                              | *  | 357                  | 74.1               |                 | 125           | Pacific           | isl          | I              |
| Cook Islands                   | Mangaia                                           | *  | 401                  | 72.9               |                 | 149           | Pacific           | isl          | I              |
| Cook Islands                   | Manihiki                                          | *  | 88                   | 73.3               |                 | 32            | Pacific           | isl          | I              |
| Cook Islands                   | Manuae                                            | *  | 24                   | 41.4               |                 | 34            | Pacific           | isl          | I              |
| Cook Islands                   | Mauke                                             | *  | 339                  | 76.4               |                 | 105           | Pacific           | isl          | I              |
| Cook Islands                   | Mitiaro                                           | *  | 234                  | 68.2               |                 | 109           | Pacific           | isl          | I              |
| Cook Islands                   | Nassau                                            | *  | 46                   | 63.0               |                 | 27            | Pacific           | isl          | I              |
| Cook Islands                   | Palmerston                                        | *  | 73                   | 67.6               |                 | 35            | Pacific           | isl          | I              |
| Cook Islands                   | Penrhyn                                           | *  | 107                  | 76.4               |                 | 33            | Pacific           | isl          | I              |
| Cook Islands                   | Pukapuka                                          | *  | 81                   | 69.8               |                 | 35            | Pacific           | isl          | I              |
| Cook Islands                   | Rakahanga                                         | *  | 71                   | 68.9               |                 | 32            | Pacific           | isl          | I              |
| Cook Islands                   | Rarotonga                                         | *  | 609                  | 70.0               |                 | 261           | Pacific           | isl          | I              |
| Cook Islands                   | Suvarrow                                          | *  | 18                   | 39.1               |                 | 28            | Pacific           | isl          | I              |
| Cook Islands                   | Takutea                                           | *  | 5                    | 13.9               |                 | 31            | Pacific           | isl          | I              |
| Federated States of Micronesia |                                                   |    | 383                  | 24.3               | 79              | 1194          | Pacific           | isl          | I              |
| Fiji                           |                                                   |    | 521                  | 22.8               | 109             | 1769          | Pacific           | isl          | I              |
| Fiji                           | Aiwa, Lau Islands                                 | *  | 4                    | 5.3                |                 | 72            | Pacific           | isl          | I              |
| Fiji                           | Lakeba, Lau Islands                               | *  | 109                  | 37.3               |                 | 183           | Pacific           | isl          | I              |
| Fiji                           | Nasoata, Fiji Islands                             | *  | 18                   | 17.0               |                 | 88            | Pacific           | isl          | I              |
| Fiji                           | Nayau, Lau Islands                                | *  | 96                   | 35.2               |                 | 177           | Pacific           | isl          | I              |
| Fiji                           | Rotuma                                            | *  | 236                  | 46.0               |                 | 277           | Pacific           | isl          | I              |
| France                         | Agakauitai, French Polynesia<br>(Gambier Islands) | *  | 34                   | 64.2               |                 | 19            | Pacific           | isl          | I              |

| Country | Subregion                                             | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|---------|-------------------------------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| France  | Ahunui, French Polynesia<br>(Tuamotu Archipelago)     | *  | 1                    | 9.1                |                 | 10            | Pacific           | isl          | I              |
| France  | Akamaru, French Polynesia<br>(Gambier Islands)        | *  | 77                   | 79.4               |                 | 20            | Pacific           | isl          | I              |
| France  | Anaa, French Polynesia<br>(Tuamotu Archipelago)       | *  | 7                    | 22.6               |                 | 24            | Pacific           | isl          | I              |
| France  | Apataki, French Polynesia<br>(Tuamotu Archipelago)    | *  | 1                    | 12.5               |                 | 7             | Pacific           | isl          | I              |
| France  | Aukena, French Polynesia<br>(Gambier Islands)         | *  | 56                   | 67.5               |                 | 27            | Pacific           | isl          | I              |
| France  | Bellingshausen, French<br>Polynesia                   | *  | 2                    | 12.5               |                 | 14            | Pacific           | isl          | I              |
| France  | Bora Bora, French Polynesia<br>(Society Islands)      | *  | 88                   | 38.6               |                 | 140           | Pacific           | isl          | I              |
| France  | Clipperton Island                                     | *  | 8                    | 36.4               |                 | 14            | Pacific           | isl          | I              |
| France  | Eiao, French Polynesia<br>(Marquesas Islands)         | *  | 62                   | 57.4               |                 | 46            | Pacific           | isl          | I              |
| France  | Fakahina, French Polynesia<br>(Tuamotu Archipelago)   | *  | 1                    | 11.1               |                 | 8             | Pacific           | isl          | I              |
| France  | Fangataufa, French Polynesia<br>(Tuamotu Archipelago) | *  | 3                    | 18.8               |                 | 13            | Pacific           | isl          | I              |
| France  | Fatu Hiva, French Polynesia<br>(Marquesas Islands)    | *  | 303                  | 63.4               |                 | 175           | Pacific           | isl          | I              |
| France  | Fatu Huku, French Polynesia<br>(Marquesas Islands)    | *  | 9                    | 56.3               |                 | 7             | Pacific           | isl          | I              |
| France  | French Polynesia                                      |    |                      |                    | 123             | 959           | Pacific           | isl          | I              |
| France  | Hao, French Polynesia<br>(Tuamotu Archipelago)        | *  | 35                   | 54.7               |                 | 29            | Pacific           | isl          | I              |
| France  | Hatutaa, French Polynesia<br>(Marquesas Islands)      | *  | 29                   | 50.9               |                 | 28            | Pacific           | isl          | I              |
| France  | Henderson, French Polynesia                           | *  | 7                    | 10.0               |                 | 63            | Pacific           | isl          | II             |
| France  | Hiti, French Polynesia<br>(Tuamotu Archipelago)       | *  | 1                    | 11.1               |                 | 8             | Pacific           | isl          | I              |
| France  | Hiva Oa, French Polynesia<br>(Marquesas Islands)      | *  | 430                  | 67.7               |                 | 205           | Pacific           | isl          | I              |
| France  | Huahine, French Polynesia<br>(Society Islands)        | *  | 72                   | 30.5               |                 | 164           | Pacific           | isl          | I              |
| France  | Kamaka, French Polynesia<br>(Gambier Islands)         | *  | 2                    | 25.0               |                 | 6             | Pacific           | isl          | I              |
| France  | Kaukura, French Polynesia<br>(Tuamotu Archipelago)    | *  | 1                    | 10.0               |                 | 9             | Pacific           | isl          | I              |
| France  | Maiao, French Polynesia<br>(Society Islands)          | *  | 17                   | 40.5               |                 | 25            | Pacific           | isl          | I              |
| France  | Makaroa, French Polynesia<br>(Gambier Islands)        | *  | 7                    | 46.7               |                 | 8             | Pacific           | isl          | I              |
| France  | Makatea, French Polynesia<br>(Tuamotu Archipelago)    | *  | 233                  | 76.1               |                 | 73            | Pacific           | isl          | I              |
| France  | Mangareva, French Polynesia<br>(Gambier Islands)      | *  | 335                  | 80.7               |                 | 80            | Pacific           | isl          | II             |
| France  | Manihi, French Polynesia<br>(Tuamotu Archipelago)     | *  | 16                   | 39.0               |                 | 25            | Pacific           | isl          | I              |
| France  | Maria, French Polynesia<br>(Austral Islands)          | *  | 4                    | 14.8               |                 | 23            | Pacific           | isl          | I              |
| France  | Marotiri, French Polynesia<br>(Austral Islands)       | *  | 4                    | 36.4               |                 | 7             | Pacific           | isl          | I              |



| Country | Subregion                                               | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|---------|---------------------------------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| France  | Marutea Sud, French Polynesia<br>(Tuamotu Archipelago)  | *  | 1                    | 12.5               |                 | 7             | Pacific           | isl          | I              |
| France  | Mataiva, French Polynesia<br>(Tuamotu Archipelago)      | *  | 1                    | 16.7               |                 | 5             | Pacific           | isl          | I              |
| France  | Matureivavao, French Polynesia<br>(Tuamotu Archipelago) | *  | 2                    | 10.0               |                 | 18            | Pacific           | isl          | I              |
| France  | Maupiti, French Polynesia<br>(Society Islands)          | *  | 87                   | 34.8               |                 | 163           | Pacific           | isl          | I              |
| France  | Mehetia, French Polynesia<br>(Society Islands)          | *  | 27                   | 38.6               |                 | 43            | Pacific           | isl          | I              |
| France  | Mohotani, French Polynesia<br>(Marquesas Islands)       | *  | 49                   | 58.3               |                 | 35            | Pacific           | isl          | I              |
| France  | Moorea, French Polynesia<br>(Society Islands)           | *  | 317                  | 54.7               |                 | 262           | Pacific           | isl          | I              |
| France  | Mopelia, French Polynesia<br>(Society Islands)          | *  | 12                   | 34.3               |                 | 23            | Pacific           | isl          | I              |
| France  | Moruroa, French Polynesia<br>(Tuamotu Archipelago)      | *  | 25                   | 69.4               |                 | 11            | Pacific           | isl          | I              |
| France  | Nengonengo, French Polynesia<br>(Tuamotu Archipelago)   | *  | 1                    | 12.5               |                 | 7             | Pacific           | isl          | I              |
| France  | New Caledonia                                           | *  | 600                  | 15.4               | 98              | 3298          | Pacific           | isl          | I              |
| France  | Niau, French Polynesia<br>(Tuamotu Archipelago)         | *  | 85                   | 59.9               |                 | 57            | Pacific           | isl          | I              |
| France  | Nuku Hiva, French Polynesia<br>(Marquesas Islands)      | *  | 569                  | 69.1               |                 | 254           | Pacific           | isl          | I              |
| France  | Oeno, French Polynesia                                  | *  | 3                    | 15.8               |                 | 16            | Pacific           | isl          | I              |
| France  | Raiatea, French Polynesia<br>(Society Islands)          | *  | 270                  | 48.7               |                 | 284           | Pacific           | isl          | I              |
| France  | Raivavae, French Polynesia<br>(Austral Islands)         | *  | 267                  | 61.7               |                 | 166           | Pacific           | isl          | I              |
| France  | Rangiroa, French Polynesia<br>(Tuamotu Archipelago)     | *  | 43                   | 51.2               |                 | 41            | Pacific           | isl          | I              |
| France  | Rapa, French Polynesia<br>(Bass Islands)                | *  | 161                  | 43.8               |                 | 207           | Pacific           | isl          | I              |
| France  | Raroia, French Polynesia<br>(Tuamotu Archipelago)       | *  | 10                   | 43.5               |                 | 13            | Pacific           | isl          | II             |
| France  | Rimatara, French Polynesia<br>(Austral Islands)         | *  | 192                  | 70.6               |                 | 80            | Pacific           | isl          | I              |
| France  | Rurutu, French Polynesia<br>(Austral Islands)           | *  | 421                  | 73.7               |                 | 150           | Pacific           | isl          | I              |
| France  | Tahaa, French Polynesia<br>(Society Islands)            | *  | 109                  | 41.0               |                 | 157           | Pacific           | isl          | I              |
| France  | Tahiti, French Polynesia<br>(Society Islands)           | *  | 1346                 | 73.8               |                 | 477           | Pacific           | isl          | I              |
| France  | Tahuata, French Polynesia<br>(Marquesas Islands)        | *  | 148                  | 63.5               |                 | 85            | Pacific           | isl          | I              |
| France  | Taiaro, French Polynesia<br>(Tuamotu Archipelago)       | *  | 1                    | 9.1                |                 | 10            | Pacific           | isl          | I              |
| France  | Takapoto, French Polynesia<br>(Tuamotu Archipelago)     | *  | 26                   | 45.6               |                 | 31            | Pacific           | isl          | I              |
| France  | Takaroa, French Polynesia<br>(Tuamotu Archipelago)      | *  | 1                    | 6.7                |                 | 14            | Pacific           | isl          | I              |
| France  | Takume, French Polynesia<br>(Tuamotu Archipelago)       | *  | 2                    | 12.5               |                 | 14            | Pacific           | isl          | I              |

| Country          | Subregion                                               | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|------------------|---------------------------------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| France           | Tarauru Roa, French Polynesia<br>(Gambier Islands)      | *  | 1                    | 11.1               |                 | 8             | Pacific           | isl          | I              |
| France           | Taravai, French Polynesia<br>(Gambier Islands)          | *  | 95                   | 82.6               |                 | 20            | Pacific           | isl          | I              |
| France           | Tauna, French Polynesia<br>(Gambier Islands)            | *  | 2                    | 22.2               |                 | 7             | Pacific           | isl          | I              |
| France           | Tekava, French Polynesia<br>(Gambier Islands)           | *  | 1                    | 14.3               |                 | 6             | Pacific           | isl          | I              |
| France           | Temoe, French Polynesia<br>(Gambier Islands)            | *  | 4                    | 30.8               |                 | 9             | Pacific           | isl          | I              |
| France           | Tenararo, French Polynesia<br>(Tuamotu Archipelago)     | *  | 2                    | 9.5                |                 | 19            | Pacific           | isl          | I              |
| France           | Tenarunga, French Polynesia<br>(Tuamotu Archipelago)    | *  | 20                   | 51.3               |                 | 19            | Pacific           | isl          | I              |
| France           | Tepoto North, French Polynesia<br>(Tuamotu Archipelago) | *  | 3                    | 18.8               |                 | 13            | Pacific           | isl          | I              |
| France           | Tetiaroa, French Polynesia<br>(Society Islands)         | *  | 18                   | 29.0               |                 | 44            | Pacific           | isl          | I              |
| France           | Tikehau, French Polynesia<br>(Tuamotu Archipelago)      | *  | 55                   | 56.1               |                 | 43            | Pacific           | isl          | I              |
| France           | Toau, French Polynesia<br>(Tuamotu Archipelago)         | *  | 15                   | 36.6               |                 | 26            | Pacific           | isl          | I              |
| France           | Tubuai, French Polynesia<br>(Austral Islands)           | *  | 304                  | 64.8               |                 | 165           | Pacific           | isl          | I              |
| France           | Tupai, French Polynesia<br>(Society Islands)            | *  | 13                   | 26.5               |                 | 36            | Pacific           | isl          | I              |
| France           | Ua Huka, French Polynesia<br>(Marquesas Islands)        | *  | 314                  | 76.4               |                 | 97            | Pacific           | isl          | I              |
| France           | Ua Pou, French Polynesia<br>(Marquesas Islands)         | *  | 270                  | 75.0               |                 | 90            | Pacific           | isl          | I              |
| France           | Vahanga, French Polynesia<br>(Tuamotu Archipelago)      | *  | 13                   | 41.9               |                 | 18            | Pacific           | isl          | I              |
| Great Britain    | Pitcairn, French Polynesia                              | *  | 90                   | 52.6               | 16              | 81            | Pacific           | isl          | II             |
| Chile            | Rapa Nui                                                |    | 68                   | 61.3               | 16              | 43            | Pacific           | isl          | II             |
| Kiribati         |                                                         |    | 174                  | 72.5               | 24              | 66            | Pacific           | isl          | I              |
| Kiribati         | Canton, Phoenix Islands                                 | *  | 47                   | 66.2               |                 | 24            | Pacific           | isl          | I              |
| Kiribati         | Enderbury, Phoenix Islands                              | *  | 6                    | 24.0               |                 | 19            | Pacific           | isl          | I              |
| Kiribati         | Gardner, Phoenix Islands                                | *  | 11                   | 36.7               |                 | 19            | Pacific           | isl          | I              |
| Kiribati         | Hull, Phoenix Islands                                   | *  | 21                   | 47.7               |                 | 23            | Pacific           | isl          | I              |
| Kiribati         | Kiritimati, Northern Line Islands                       | *  | 49                   | 54.4               |                 | 41            | Pacific           | isl          | I              |
| Kiribati         | McKean, Phoenix Islands                                 | *  | 1                    | 12.5               |                 | 7             | Pacific           | isl          | I              |
| Kiribati         | Northern Line Islands                                   |    | 41                   | 53.9               |                 | 35            | Pacific           | isl          | I              |
| Kiribati         | Palmyra, Norther Line Islands                           | *  | 38                   | 64.4               |                 | 21            | Pacific           | isl          | I              |
| Kiribati         | Sydney, Phoenix Islands                                 | *  | 11                   | 37.9               |                 | 18            | Pacific           | isl          | I              |
| Kiribati         | Tabueran                                                | *  | 94                   | 78.3               |                 | 26            | Pacific           | isl          | I              |
| Kiribati         | Teraina, Norther Line Islands                           | *  | 63                   | 70.8               |                 | 26            | Pacific           | isl          | I              |
| Marshall Islands |                                                         |    | 285                  | 76.8               | 36              | 86            | Pacific           | isl          | I              |
| Marshall Islands | Ailinginae Atoll                                        | *  | 8                    | 27.6               |                 | 21            | Pacific           | isl          | I              |
| Marshall Islands | Eniwetok                                                | *  | 50                   | 54.9               |                 | 41            | Pacific           | isl          | I              |
| Marshall Islands | Majuro Atoll                                            | *  | 17                   | 23.3               |                 | 56            | Pacific           | isl          | I              |
| Marshall Islands | Rongelap Atoll                                          | *  | 35                   | 56.5               |                 | 27            | Pacific           | isl          | I              |
| Nauru            |                                                         | *  | 368                  | 86.0               | 25              | 60            | Pacific           | isl          | I              |
| New Zealand      | Niue                                                    |    | 307                  | 63.7               | 62              | 175           | Pacific           | isl          | I              |
| Palau            |                                                         |    | 344                  |                    | 58              |               | Pacific           | isl          | I              |
| Samoa            |                                                         |    | 321                  | 36.9               | 63              | 550           | Pacific           | isl          | I              |

| Country   | Subregion                                     | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|-----------|-----------------------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Samoa     | Fanuatapu                                     | *  | 18                   | 24.3               |                 | 56            | Pacific           | isl          | I              |
| Samoa     | Namua                                         | *  | 59                   | 31.4               |                 | 129           | Pacific           | isl          | I              |
| Samoa     | Nuulua                                        | *  | 16                   | 16.8               |                 | 79            | Pacific           | isl          | I              |
| Samoa     | Nuutela                                       | *  | 46                   | 23.1               |                 | 153           | Pacific           | isl          | I              |
| Tonga     |                                               | *  | 301                  | 40.0               | 63              | 451           | Pacific           | isl          | I              |
| Tuvalu    |                                               |    |                      |                    | 5               | 50            | Pacific           | isl          | I              |
| USA       | Agrihan, Marianas                             | *  | 69                   | 37.9               |                 | 113           | Pacific           | isl          | I              |
| USA       | Aguijan, Marianas                             | *  | 33                   | 37.5               |                 | 55            | Pacific           | isl          | I              |
| USA       | Alamagan, Marianas                            | *  | 71                   | 36.6               |                 | 123           | Pacific           | isl          | I              |
| USA       | American Samoa                                |    | 236                  | 33.4               | 50              | 471           | Pacific           | isl          | I              |
| USA       | Anatahan, Marianas                            | *  | 54                   | 35.1               |                 | 100           | Pacific           | isl          | I              |
| USA       | Asuncion Island, Marianas                     | *  | 16                   | 20.5               |                 | 62            | Pacific           | isl          | I              |
| USA       | Aunuu                                         | *  | 80                   | 45.2               |                 | 97            | Pacific           | isl          | I              |
| USA       | Farallon de Pajaros, Marianas                 | *  | 1                    | 5.9                |                 | 16            | Pacific           | isl          | I              |
| USA       | French Frigate Shoals,<br>Hawai'i Archipelago | *  | 24                   | 66.7               |                 | 12            | Pacific           | isl          | I              |
| USA       | Guam                                          | *  | 833                  | 66.5               | 56              | 420           | Pacific           | isl          | I              |
| USA       | Guguan, Marianas                              | *  | 11                   | 17.2               |                 | 53            | Pacific           | isl          | I              |
| USA       | Hawai'i, Hawai'i Archipelago                  | *  | 906                  | 62.1               |                 | 553           | Pacific           | isl          | I              |
| USA       | Hawaii Archipelago                            |    | 1488                 | 48.4               | 53              | 1586          | Pacific           | isl          | I              |
| USA       | Johnston Island                               | *  | 24                   | 88.9               | 5               | 3             | Pacific           | isl          | I              |
| USA       | Kaho'olawe,<br>Hawai'i Archipelago            | *  | 136                  | 68.3               |                 | 63            | Pacific           | isl          | I              |
| USA       | Kaua'i, Hawai'i Archipelago                   | *  | 686                  | 52.4               |                 | 622           | Pacific           | isl          | I              |
| USA       | Ka'ula Rock,<br>Hawai'i Archipelago           | *  | 12                   | 92.3               |                 | 1             | Pacific           | isl          | II             |
| USA       | Kure, Hawai'i Archipelago                     | *  | 39                   | 66.1               |                 | 20            | Pacific           | isl          | I              |
| USA       | Lana'i, Hawai'i Archipelago                   | *  | 386                  | 51.7               |                 | 360           | Pacific           | isl          | I              |
| USA       | Laysan, Hawai'i Archipelago                   | *  | 11                   | 26.8               |                 | 30            | Pacific           | isl          | I              |
| USA       | Lehua, Hawai'i Archipelago                    | *  | 37                   | 100.0              |                 | 0             | Pacific           | isl          | II             |
| USA       | Lisianski island,<br>Hawai'i Archipelago      | *  | 3                    | 16.7               |                 | 15            | Pacific           | isl          | I              |
| USA       | Maug Islands, Marianas                        | *  | 16                   | 22.5               |                 | 55            | Pacific           | isl          | I              |
| USA       | Maui, Hawai'i Archipelago                     | *  | 875                  | 58.4               |                 | 624           | Pacific           | isl          | I              |
| USA       | Midway, Hawai'i Archipelago                   | *  | 120                  | 80.5               | 5               | 29            | Pacific           | isl          | II             |
| USA       | Moloka'i, Hawai'i Archipelago                 | *  | 493                  | 50.3               |                 | 487           | Pacific           | isl          | II             |
| USA       | Nihoa, Hawai'i Archipelago                    | *  | 6                    | 23.1               |                 | 20            | Pacific           | isl          | II             |
| USA       | Ni'ihau, Hawai'i Archipelago                  | *  | 91                   | 48.7               |                 | 96            | Pacific           | isl          | II             |
| USA       | Northern Mariana Islands                      |    | 298                  | 41.5               | 35              | 420           | Pacific           | isl          | I              |
| USA       | O'ahu, Hawai'i Archipelago                    | *  | 913                  | 61.2               |                 | 578           | Pacific           | isl          | II             |
| USA       | Ofu                                           | *  | 86                   | 28.3               |                 | 218           | Pacific           | isl          | I              |
| USA       | Olosega                                       | *  | 33                   | 12.9               |                 | 223           | Pacific           | isl          | I              |
| USA       | Pagan, Mariana Islands                        | *  | 101                  | 42.6               |                 | 136           | Pacific           | isl          | I              |
| USA       | Pearl & Hermes,<br>Hawai'i Archipelago        | *  | 10                   | 40.0               |                 | 15            | Pacific           | isl          | II             |
| USA       | Rota, Marianas                                | *  | 239                  | 45.7               |                 | 284           | Pacific           | isl          | I              |
| USA       | Saipan, Marianas                              | *  | 231                  | 47.9               |                 | 251           | Pacific           | isl          | I              |
| USA       | Sarigan, Marianas                             | *  | 40                   | 29.9               |                 | 94            | Pacific           | isl          | I              |
| USA       | Swains                                        | *  | 32                   | 54.2               |                 | 27            | Pacific           | isl          | I              |
| USA       | Tau                                           | *  | 131                  | 27.9               |                 | 338           | Pacific           | isl          | I              |
| USA       | Tinian, Marianas                              | *  | 214                  | 54.0               |                 | 182           | Pacific           | isl          | I              |
| USA       | Tutuila                                       | *  | 177                  | 30.7               |                 | 399           | Pacific           | isl          | I              |
| Vanuatu   |                                               |    |                      |                    | 26              | 870           | Pacific           | isl          | I              |
| Dominica  |                                               | *  | 81                   | 6.2                | 16              | 1226          | South-Amer        | isl          | II             |
| Argentina | Tierra del Fuego                              | *  | 136                  | 24.6               |                 | 417           | South-Amer        | isl          | IX             |

| Country            | Subregion                                           | NO | Naturali-<br>zed no. | Naturali-<br>zed % | Invasive<br>no. | Native<br>no. | TDWG<br>continent | Main<br>/Isl | Zono-<br>biome |
|--------------------|-----------------------------------------------------|----|----------------------|--------------------|-----------------|---------------|-------------------|--------------|----------------|
| Aruba              |                                                     | *  | 32                   | 6.5                | 6               | 460           | South-Amer        | isl          | II             |
| Bahamas            |                                                     | *  | 356                  | 24.3               | 56              | 1111          | South-Amer        | isl          | II             |
| Barbados           |                                                     | *  | 91                   | 13.7               | 16              | 572           | South-Amer        | isl          | II             |
| Bonaire            |                                                     | *  | 38                   |                    | 10              |               | South-Amer        | isl          | I              |
| Brazil             | Trindade and Martin Vaz                             | *  | 65                   | 56.0               |                 | 51            | South-Amer        | isl          | I              |
| Cuba               |                                                     | *  | 542                  | 7.7                | 181             | 6498          | South-Amer        | isl          | II             |
| Dominican Republic |                                                     | *  | 227                  | 3.9                | 45              | 5600          | South-Amer        | isl          | II             |
| Ecuador            | Galapagos                                           | *  | 263                  | 32.3               | 48              | 552           | South-Amer        | isl          | II             |
| France             | Maria Galante                                       | *  | 17                   |                    |                 |               | South-Amer        | isl          | II             |
| France             | Martinique                                          | *  | 144                  | 8.7                | 13              | 1505          | South-Amer        | isl          | I              |
| France             | Saint Barthelemy                                    | *  | 29                   |                    |                 |               | South-Amer        | isl          | II             |
| Ecuador            | Galapagos                                           | *  | 263                  | 32.3               | 48              | 552           | South-Amer        | isl          | II             |
| Great Britain      | Anegada, British Virgin Islands                     | *  | 4                    | 2.1                |                 | 184           | South-Amer        | isl          | II             |
| Great Britain      | Anguilla                                            | *  | 29                   | 19.5               | 6               | 120           | South-Amer        | isl          | II             |
| Great Britain      | Antigua                                             | *  | 66                   |                    |                 |               | South-Amer        | isl          | II             |
| Great Britain      | Antigua and Barbuda                                 |    |                      |                    | 17              | 1158          | South-Amer        | isl          | II             |
| Great Britain      | Barbuda                                             | *  | 14                   |                    |                 |               | South-Amer        | isl          | II             |
| Great Britain      | Bermuda                                             | *  | 60                   | 26.7               | 27              | 165           | South-Amer        | isl          | II             |
| Great Britain      | Cayman Islands                                      | *  | 218                  | 28.8               | 9               | 539           | South-Amer        | isl          | II             |
| Great Britain      | Guana Island,<br>British Virgin Islands             | *  | 84                   |                    |                 |               | South-Amer        | isl          | II             |
| Great Britain      | Jost van Dyke,<br>British Virgin Islands            | *  | 7                    |                    |                 |               | South-Amer        | isl          | II             |
| Great Britain      | Montserrat                                          | *  | 191                  | 21.4               | 16              | 700           | South-Amer        | isl          | II             |
| Great Britain      | Tortola, British Virgin Islands                     | *  | 198                  |                    |                 |               | South-Amer        | isl          | II             |
| Great Britain      | Virgin Gorda,<br>British Virgin Islands             | *  | 107                  |                    |                 |               | South-Amer        | isl          | II             |
| Grenada            |                                                     | *  | 24                   | 2.2                | 11              | 1068          | South-Amer        | isl          | II             |
| Haiti              |                                                     |    |                      |                    | 5               | 5242          | South-Amer        | isl          | II             |
| Haiti              | Gonave                                              | *  | 113                  |                    |                 |               | South-Amer        | isl          | I              |
| Haiti              | Tortuga Island                                      | *  | 113                  |                    |                 |               | South-Amer        | isl          | I              |
| Chile              | Alejandro Selkirk Island,<br>Juan Fernandez Islands | *  | 118                  | 50.6               |                 | 115           | South-Amer        | isl          | V              |
| Chile              | Juan Fernandez Islands                              |    | 232                  | 52.6               |                 | 209           | South-Amer        | isl          | V              |
| Chile              | Robinson Crusoe Island,<br>Juan Fernandez Islands   | *  | 190                  | 56.9               |                 | 144           | South-Amer        | isl          | V              |
| Chile              | Santa Clara Island,<br>Juan Fernandez Islands       | *  | 25                   | 71.4               |                 | 10            | South-Amer        | isl          | V              |
| Chile              | Tierra del Fuego                                    | *  | 54                   | 18.1               |                 | 245           | South-Amer        | isl          | IX             |