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TOWARDS ALIEN PLANT PRIORITIZATION IN ITALY: METHODOLOGICAL ISSUES AND FIRST RESULTS

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Abstract

In recent decades, multiple actions have been taken to counteract the relentless expansion of invasive alien species as well as to gain a better understanding of their effects on ecosystems. Here, we describe the approach designed by the Italian Botanical Society that is aimed at selecting a list of candidate alien plants to be subjected to a prioritization procedure. We selected a total of 96 species on the basis of data related to their occurrence on both a national and regional scale, their invasiveness and their potential to invade plant communities and/or habitats of community concern. This list represents the first result obtained by applying this standardized workflow and is a first step towards the identification of those alien species that should be included in the national list according to Regulation (EU) n. 1143/2014.

Keywords: Non-native flora; National list of alien species; EU regulation on IAS; Habitats; Impacts; Prioritization

1. INTRODUCTION

Invasive alien species (IASs) can have strong socio-economic and ecological impacts and pose one of the most serious threats to the conservation of biodiversity and ecosystem functions on a global scale (Convention on Biological Diversity, 2018). Since the number of newly established IASs is rapidly increasing at the global level (Seebens et al. 2017), it is essential that reliable criteria be drawn up for the identification of the species that need to be controlled and managed most.

In view of this threat, the European Parliament and the Council adopted Regulation (EU) n. 1143/2014 on the prevention and management of the introduction and spread of IASs (European Commission 2014). This act, which entered into force on January 1, 2015, sets out rules to tackle the adverse impacts of IASs on biodiversity within the Union and includes the possibility for Member States to establish national lists of invasive alien species of national concern. Italy has implemented this regulation with the Legislative Decree no. 230 (15 December 2017) concerning the "*Adjustment of national legislation to the provisions of regulation (EU) n. 1143/2014 of the European Parliament and of the Council of 22 October 2014, containing provisions aimed at preventing and managing the introduction and dissemination of invasive alien species*".

Accordingly, on behalf of the Italian Ministry of the Environment (MATTM), the Italian Institute for Environmental Protection and Research (ISPRA) has developed a series of projects aimed at creating a national database of IAS.

These projects have involved the leading Italian scientific societies in drawing up a list of the alien species found in Italy that need to be stringently controlled.

One of the most important outcomes of this strategy is expected to be a list of priority alien species that may be included in the National List of IASs [Article 12, of the Regulation (EU) n. 1143/2014,

European Commission, 2014]. Within this context, the Italian Botanical Society (hereafter referred to as SBI) has been involved in: 1) updating the National Alien Plant Species Data Base (NAPSDB); 2) selecting a list of candidate Invasive Alien Plants (IAPs) to be further assessed at the national level; and lastly 3) adopting the prioritization methodology developed by ISPRA to identify alien plants whose inclusion in the national list ex Regulation (EU) n. 1143/2014 should receive priority.

Italy has a long tradition of botanical research on non-native plants. Saccardo (1909) compiled an inventory of first records for a large number of introduced plants using information available in the literature and herbaria records since Roman and Medieval times. Béguinot and Mazza (1916) and Viegi (1974) later published comprehensive inventories of the Italian non-native flora. Since the early 2000s, the SBI has carried out a series of research projects funded by the MATTM to provide a global picture of the non-native vascular flora at the national scale (Celesti-Grapow et al. 2009; 2010). In addition, a major effort has been made to identify, among the high number of alien species present, the few that may threaten the environment, human health or economy. Several projects have been carried out to assess the impact of alien species on the most vulnerable habitats (e.g. Bolpagni et al. 2015; Celesti-Grapow and Blasi 2004; Celesti-Grapow et al. 2016), as well as to describe the most relevant alien species across ecosystems (e.g. Bolpagni et al. 2013; Brundu et al. 2013; Bolpagni and Piotti 2015; Lazzaro et al. 2016, 2017, 2018a; Lastrucci et al. 2018).

Two examples of such species are *Vallisneria spiralis*, a very invasive alien aquatic species outside Italy (Bolpagni et al. 2015), and *Ambrosia artemisiifolia* (Gentili et al. 2017), an annual species that is typical of disturbed habitats (e.g. railways, riverbeds and arable fields) with a high allergenic potential.

Using a standardized approach adopted by a nationwide network of botanists, all the data and assessments of alien plants, which are continually updated, are entered in a comprehensive system of integrated regional and national databases, which have provided the scientific basis for the development of plant invasion research and management in the country (Celesti-Grapow et al. 2009). The species inventory, which was recently updated by Galasso et al. (2018), has provided a new national checklist of the alien vascular flora.

The high number of established (syn. naturalised) alien *taxa* in Italy (791; see Galasso et al. 2018) is such that attention needs to be concentrated on a shorter list of species that focuses on a quantitative assessment of their impacts and effective management strategies. Hence, we applied a workflow that is based on the criteria laid out in the EU Regulation and is tailored to the Italian situation. Accordingly, the present paper is aimed at presenting the list of candidate species that should be prioritized and the methodology used to select these species. This list is a starting point for the prioritization of alien plants in Italy that may also be used to draw up national lists of invasive alien species of concern for other taxonomical groups (such as mammals, invertebrates and fish). This prioritization process and the resulting list will be discussed and defined during expert meetings coordinated by ISPRA, according to a consensus prioritization process aimed at consolidating the National List ex Regulation (EU) n. 1143/2014.

2. MATERIAL AND METHODS

A multi-criteria approach was developed and applied to select the list of candidate invasive species to be included in the prioritization procedure (*sensu* Branquart et al. 2016; Booy et al. 2017; Carboneras et al. 2018), as shown in the flow chart in Figure 1. This approach was designed to achieve the highest possible level of systematization and replicable interpretation of the knowledge available on IAPs in Italy.

The criteria used are: 1) the species have to be established in the Italian territory, 2) the species are expected to have high impact on biodiversity (subcriterion 2.1) and on community/habitats or ecosystem functions and services (subcriterion 2.2) and 3) the species have a limited or very narrow regional distribution (i.e. are present in a few regions). To sum up, the list of IAPs to be included in the national prioritization procedure should contain established *taxa* whose impact potential is high

but whose spread in Italy is still limited. As a measure of the latter, we used as a proxy the establishment of the species in each of the 20 administrative regions. This approach, founded on the compilation of regional floristic databases yielded by local research projects, follows a consolidated tradition in Italy (Celesti-Grappo et al. 2010). We decided to focus on IAPs whose range is limited because the chance of success in case of national or regional eradication or control actions is likely to be higher.

The presence and establishment of the species (criterion 1) and their impact on biodiversity (subcriterion 2.1) were considered at the national level. Indeed, we considered the establishment of each *taxon* and its ability to cause ecological impacts in at least one region as two indispensable inclusion criteria. The “community/habitat impact” and the “regional occurrence” (criteria 2.2 and 3) were instead evaluated at the regional level (by considering the records available for each of the 20 administrative regions of Italy). These last two criteria should account, respectively, for the potential or current risk posed by the IAPs and for the feasibility of management control (or eradication) actions.

Our starting point was the NAPSDB hosted by the ISPRA and elaborated by the SBI (updated to 31/12/2017, as provided to the ISPRA). This database is based on the first systematic review of the alien flora of Italy (Celesti-Grappo et al. 2009, 2010), which has continually been updated by regional experts since it was presented (Galasso et al. 2018; Italian Botanist: Notulae to the Italian alien vascular flora, see Galasso et al. 2018). The NAPSDB includes 1366 entities together with information on the status, occurrence and impacts of these alien plants at both the national and regional levels. The nomenclature and establishment status adopted in the NAPSDB follow the *Italian checklist of vascular flora alien to Italy* (Galasso et al. 2018). However, in few cases the well-established nomenclature adopted in a number of international databases was maintained in order to facilitate the sharing of information such as [e.g. *Salvinia molesta* D.S.Mitch. [= *Salvinia adnata* Desv.] and *Setaria pycnocoloma* (Steud.) Henrard ex Nakai [= *Setaria italica* (L.) P.Beauv. subsp. *pycnocoloma* (Steud.) de Wet]. As for the invasive status of the plants, we adopted the operational definition related to impacts based on IUCN decisions (Blackburn et al. 2014). According to this definition, an established species is considered invasive when responsible for the emergence of an environmental impact defined as “a measurable change to the properties of an ecosystem (by an alien species)”.

We first excluded all the doubtful records and any species not recorded since 1950 from the NAPSDB. In addition, we excluded from the present analysis any species already subjected to specific legislation; i.e. already included in the List of Invasive Alien Species of Union concern. We thus obtained a list of 1206 alien plants that grow spontaneously in Italy, comprising *taxa* whose occurrence status is either established or not established. We subjected this list to a further selection by assigning “invasiveness” values to the *taxa* according to the following categories: 1 Invasive, 2 Not invasive, 3 Not specified, and 4 Uncertain, considering only those species to which an “invasive” status was assigned. This selection procedure was finetuned by considering the assessments provided at the national scale by the Italian Society of Vegetation Science (SISV). These evaluations were elaborated within the framework of the project “Updating of the National Alien Species Data Base under the *Work Program to support the Implementation of Regulation (EU) n. 1143/2014 on invasive alien species*” (Lazzaro et al. 2018b). This parallel project gathered and evaluated all the national data available on the impacts of alien plants on natural habitats (*sensu* Habitat Directive) and plant communities, after which an expert-based evaluation procedure and consensus processes were applied during a national workshop. Species considered in the SISV database are indeed the same of NAPSDB, and thus these two databases overlap considerably. Nevertheless, the use of SISV databases allowed us to add some species considered to exert impact on natural habitats (*sensu* Habitat Directive) and plant communities, but not considered invasive according to NAPSDB.

The regional occurrence of the selected established and impacting species was subsequently evaluated by setting specific spatial thresholds. Accordingly, IAPs were split into the following four

classes of geographical representativeness: *taxa* reported in 1 to 3 regions, 4 to 6 regions, 7 to 9 regions, and in more than 9 regions. The same classification was applied to species that have impacts at the community and/or habitat levels from SISV database (we thus considered only the species exerting impact in max 6 regions). Alien plants reported within the lowest categories (i.e. those occurring and/or exerting impacts in a few regions) can in theory be successfully targeted by means of control/eradication actions. It should indeed be borne in mind that the more widespread an alien plant is, the less likely it is to be successfully targeted by means of control, management or eradication actions. A priority status was hence assigned to alien plants with narrow spatial ranges (not more than six administrative regions).

In summary, only species that fulfilled the following criteria were selected:

- 1) being present and fully established in Italy by December 2017;
- 2) being invasive;
- 3) being potentially harmful to plant communities and/or habitats of conservation importance;
- 4) not being widespread in Italy.

In addition, a few species selected by the expert-working group (made up of the authors of this paper) by consensus and based on their experience in the field were also added to the list.

We focused on *taxa* that were not identified by the criteria and thresholds laid out in the aforementioned selection procedures and could thus be considered as newcomers or emerging alien plants.

3. RESULTS AND DISCUSSION

A total of 96 species were included in the list of candidate species for Italy (Table 1).

Specifically, starting from the NAPSDDB, the first inclusion criterion revealed that 559 *taxa* – out of the total 1206 species investigated (equal to 46.6%) – are currently present in the country. The second inclusion criterion led to the identification of 143 of these species as “invasive”.

When the regional distribution thresholds were applied, about one-third (43) of the invasive plants were found to be present in fewer than six regions: 19 *taxa* in no more than 3 regions and 24 *taxa* in 4 to 6 regions. This list does not include *taxa* with doubtfully records [*Acacia retinodes* Schltld.; *Crassula helmsii* (Kirk) Cockayne; *Opuntia amyclaea* Ten.; *Myoporum tenuifolium* G.Forst.], and species already included in the List of Invasive Alien Species of Union concern [*Baccharis halimifolia* L., *Impatiens glandulifera* Royle, *Lagarosiphon major* (Ridl.) Moss, *Pennisetum setaceum* (Forssk.) Chiov. [= *Cenchrus setaceus* (Forssk.) Morrone], and *Pueraria lobata* (Willd.) Ohwi].

The 43 invasive species extracted from NAPSDDB that resulted “localized” (recorded in ≤ 6 regions) constitute our core *taxa* to submit to the prioritization procedures. Alongside this analysis, we selected further “localized” 44 invasive species from the list compiled by SISV including alien plants with an adverse impact on biodiversity at the community and/or habitat level. These species – occurring in not more than six regions based on SISV database but possibly in more than 6 regions in the NAPSDDB database – are mostly considered only casual or not invasive in NAPSDDB, but considered to exert some level of impacts according to SISV’ assessments (see Lazzaro et al. 2018b). Merging the two sets, we obtained a preliminary list of 87 invasive alien plants to be submitted to the prioritization process (Table 1).

This list was subsequently integrated by adding nine species with significant impacts on biodiversity but that, nevertheless, exhibit a rather low level of current impact at the national scale (for a total number of 96 candidate species; Table 1). We focused on *taxa* with a rather wide distribution and with clear, serious impacts [i.e. *Acacia melanoxylon* R.Br., *A. saligna* (Labill.) H.L.Wendl., *Chasmanthe aethiopica* (L.) N.E.Br., *Cortaderia selloana* (Schult. & Schult.f.) Asch. & Graebn., *Quercus rubra* L., *Reynoutria x bohémica* (Chrtek & Chrtková) Zika & Jacobson (= *Reynoutria bohémica* Chrtek & Chrtková), *Senecio inaequidens* DC., *Sicyos angulatus* L. and *Tradescantia fluminensis* Vell.]. Indeed, for these nine species effective management is believed to be still possible in Italy, at least in some regions or on islands.

4. CONCLUSIONS AND FUTURE RESEARCH PERSPECTIVES

Using a comprehensive dataset, a list of candidate plant species was set for a prioritization procedure that may lead to their inclusion in a national list of invasive species according to Regulation (EU) n. 1143/2014. This list is based on data collected over many years by an Italian network of botanists and plant ecologists, including data on the species' regional distribution and invasiveness as well as on specific threats posed to plant communities and habitats of conservation concern. Indeed, we followed the main criteria of the Regulation (EU) n. 1143/2014, which places an emphasis on prevention and early warning approaches.

Hence, we focused on species with a limited distribution within Italy that can, despite their invasiveness, be targeted for successful control/eradication efforts. Nevertheless, we also put the emphasis on the Italian situation, including species with a higher degree of spread, but whose control would be particularly beneficial. It should be noted that the list includes also species occurring in more than 6 regions. In some cases, these species correspond to those added according to the SISV database and expert opinion, but also due to the updates of the NAPSDB used in the first instance (dated 31/12/2017) and on regional occurrences (Galasso et al. 2018). These differences highlight how fast the spread and the distribution of alien species may change, imposing a continuous updating of databases.

The 96 selected IAPs should not be considered as critical (excluding the nine *taxa* selected by expert consensus). These species then will undergo a further procedure (*sensu* Branquart et al. 2016) designed to assess their current invasive potential and allow the priority *taxa* to be selected. This approach reliably identified invasive species of national concern for the conservation of biodiversity, and it may prove useful as a preliminary selection step in other contexts.

Authors contributions

All authors were involved in conceiving the idea and designing methodology. Specifically, R. Bolpagni and L. Lazzaro led the development and writing of the manuscript, performing the database inspection and the species selection; E. Barni, G. Brundu, L. Celesti-Grapow and C. Siniscalco contributed critically to the draft; C. Blasi fostered the project. L. Celesti-Grapow coordinated the work on the species lists on behalf of SBI. All authors gave final approval for publication.

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LITERATURE

- Béguinot A, Mazza O. 1916. Le avventizie esotiche della flora italiana e le leggi che ne regolano l'introduzione e la naturalizzazione. *N Giorn Bot Ital* 23(3):403–465.
- Blackburn TM, Essl F, Evans T, Hulme PE, Jeschke JM, Kühn I, Kumschick S, Marková S, Mrugała A, Nentwig W, et al. 2014. A unified classification of alien species based on the magnitude of their environmental impacts. *PLoS Biol.* 12(5):e1001850.
- Booy O, Mill AC, Roy HE, Hiley A, Moore N, Robertson P, Baker S, Brazier M, Bue M, Bullock R, et al. 2017. Risk management to prioritise the eradication of new and emerging invasive non-native species. *Biol Invas* 19:2401–2417.

- Bolpagni R, Piotti A. 2015. Hydro-hygrophilous vegetation diversity and distribution patterns in riverine wetlands in an agricultural landscape: a case study from the Oglio River (Po Plain, Northern Italy). *Phytocoenologia* 45(1-2):69–84.
- Bolpagni R, Bartoli M, Viaroli P. 2013. Species and functional plant diversity in a heavily impacted riverscape: Implications for threatened hydro-hygrophilous flora conservation. *Limnologica* 43: 230-238.
- Bolpagni R, Laini A, Soana E, Tomaselli M, Nascimbene J. 2015. Growth performance of *Vallisneria spiralis* under oligotrophic conditions supports its potential invasiveness in mid elevation freshwaters. *Weed Res* 55(2):185–194.
- Branquart E, Brundu G, Buholzer S, Chapman D, Ehret P, Fried G, Starfinger U, van Valkenburg J, Tanner R. 2016. A prioritization process for invasive alien plant species incorporating the requirements of EU Regulation no. 1143/2014. *EPPO Bull* 46:603–617.
- Brundu G, Azzella MM, Blasi C, Camarda I, Iberite M, Celesti-Grapow L. 2013. The silent invasion of *Eichhornia crassipes* (Mart.) Solms. in Italy. *Plant Biosyst* 147:1120–1127.
- Carboneras C, Genovesi P, Vilà M, Blackburn TM, Carrete M, Clavero M, D'hondt B, Orueta JF, Gallardo B, Gheraldes P, et al. 2018. A prioritised list of invasive alien species to assist the effective implementation of EU legislation. *J Appl Ecol* 55:539–547.
- Celesti-Grapow L, Blasi C 2004. The role of alien and native weeds in the deterioration of archaeological remains in Italy. *Weed Technol* 18:1508–1513.
- Celesti-Grapow L, Alessandrini A, Arrigoni PV, Banfi E, Bernardo L, Bovio MC, Brundu G, Cagiotti RM, Camarda I, Carli E, et al. 2009. Inventory of the Non-native Flora of Italy. *Plant Biosyst* 143(2):386–430.
- Celesti-Grapow L, Alessandrini A, Arrigoni PV, Assini S, Barni E, Bovio M, Brundu G, Gagiotti MR, Camarda I, Carli E, et al. 2010. Non-native flora of Italy: Species distribution and threats. *Plant Biosyst* 144(1):12–28.
- Celesti-Grapow L, Bassi L, Brundu G, Camarda I, Carli E, D’Auria G, Del Guacchio E, Domina G, Ferretti G, Foggi B, et al. 2016. Plant invasions on small Mediterranean islands: An overview. *Plant Biosyst* 150:1119–1133.
- Convention on Biological Diversity. 2018. “COP 6 Decision VI/23.” 2018. <https://www.cbd.int/decision/cop/?id=7197>.
- European Commission 2014. Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the Prevention and Management of the Introduction and Spread of Invasive Alien Species. *Off. J. Eur. Union* 317.
- Galasso G, Conti F, Peruzzi L, Ardenghi NMG, Banfi E, Celesti-Grapow L, Albano A, Alessandrini A, Bacchetta G, Ballelli S, et al. 2018. An updated checklist of the vascular flora alien to Italy. *Plant Biosyst* 152(3):556–592.
- Gentili R, Gilardelli F, Bona E, Prosser F, Selvaggi A, Alessandrini A, Martini F, Nimis PL, Wilhelm T, Adorni M, et al. 2017. Distribution map of *Ambrosia artemisiifolia* L. (Asteraceae) in Italy. *Plant Biosyst* 151:381–386.
- Lastrucci L, Lazzaro L, Dell’Olmo L, Foggi B, Cianferoni F. 2018. Impacts of *Myriophyllum aquaticum* invasion in a Mediterranean wetland on plant and macro-arthropod communities. *Plant Biosyst* 152:427–435.
- Lazzaro L, Foggi B, Ferretti G, Brundu G. 2016. Priority invasive alien plants in the Tuscan Archipelago (Italy): comparing the EPPO prioritization scheme with the Australian WRA. *Biol Invasions* 18(5):1317–1333.
- Lazzaro L, Viciani D, Dell’Olmo L, Foggi B. 2017. Predicting risk of invasion in a Mediterranean island using niche modelling and valuable biota. *Plant Biosyst* 151:361–370.
- Lazzaro L, Mazza G, d’Errico G, Fabiani A, Giuliani C, Inghilesi AF, Lagomarsino A, Landi S, Lastrucci L, Pastorelli R, et al. 2018a. How ecosystems change following invasion by *Robinia pseudoacacia*: Insights from soil chemical properties and soil microbial, nematode, microarthropod and plant communities. *STOTEN* 622:1509–1518.

- Lazzaro L, Bolpagni R; Acosta ATR, Adorni M, Aleffi M, Allegrezza M, Angiolini C, Assini S, Bagella S, Bonari G, et al. 2018b. An assessment of the impacts of invasive alien plants on habitats in Italy: first results from the ISPRA-SISV convention. NEOBIOTA 2018 10th International Conference on Biological Invasions. New Directions in Invasion Biology. Dún Laoghaire, Dublin, Ireland, 3-7 September 2018. Programme & Book of Abstracts, p 84.
- Saccardo PA. 1909. Cronologia della flora italiana. Padova, Tipografia del Seminario, p 388.
- Seebens H, Blackburn TM, Dyer EE, Genovesi P, Hulme PE, Jeschke JM, Pagad S, Pyšek P, Winter M, Arianoutsou M, et al. 2017. No saturation in the accumulation of alien species worldwide. *Nat Commun* 8:14435.
- Viegi L. 1974. Definizione e nomenclatura delle specie esotiche della Flora Italiana. *Inform Bot Ital* 6:136–137.

Table 1. List of the candidate species to be submitted to the national prioritization procedure for their inclusion in a national list according to the Regulation (EU) n. 1143/2014. For each *taxon*, we provide the number of regions in which the species occurs (according to Galasso et al. 2018 and subsequent update). Number of regions in which the species is having an impact on plant communities is given according to SISV database (Lazzaro et al. 2018b). Species marked with \$ were added according to an expert-based assessment.

Species	Family	Number of region in which the species occurs	Number of regions with impacts on plant communities
<i>Acacia longifolia</i> (Andrews) Willd.	Fabaceae	5	2
<i>Acacia mearnsii</i> De Wild.	Fabaceae	1	1
§ <i>Acacia melanoxylon</i> R.Br.	Fabaceae	5	1
<i>Acacia pycnantha</i> Benth.	Fabaceae	2	2
§ <i>Acacia saligna</i> (Labill.) H.L.Wendl.	Fabaceae	10	7
<i>Amaranthus muricatus</i> (Moq.) Gillies ex Hieron.	Amaranthaceae	4	1
<i>Amaranthus tuberculatus</i> (Moq.) J.D.Sauer	Amaranthaceae	8	3
<i>Ambrosia trifida</i> L.	Asteraceae	8	3
<i>Ammannia coccinea</i> Rottb.	Lythraceae	4	1
<i>Anredera cordifolia</i> (Ten.) Steenis	Basellaceae	11	1
<i>Apios americana</i> Medik.	Fabaceae	5	2
<i>Araujia sericifera</i> Brot.	Apocynaceae	12	2
<i>Arctotheca calendula</i> (L.) Levyns	Asteraceae	4	1
<i>Asclepias fruticosa</i> L.	Apocynaceae	8	1
<i>Bidens comata</i> Muhl. ex Willd.	Asteraceae	7	1
<i>Bidens subalternans</i> DC.	Asteraceae	13	3
<i>Boerhavia coccinea</i> Mill.	Nyctaginaceae	2	0
<i>Bumias orientalis</i> L.	Brassicaceae	7	1
<i>Campsis radicans</i> (L.) Bureau	Bignoniaceae	17	1
<i>Capsella grandiflora</i> (Fauché & Chaub.) Boiss.	Brassicaceae	2	1
<i>Carex vulpinoidea</i> Michx.	Cyperaceae	5	1
<i>Catalpa ovata</i> G.Don	Bignoniaceae	3	1
<i>Catalpa speciosa</i> Teas	Bignoniaceae	2	1
<i>Cenchrus longispinus</i> (Hack.) Fernald	Poaceae	14	2
<i>Centaurea diluta</i> Aiton	Asteraceae	7	1
§ <i>Chasmanthe aethiopica</i> (L.) N.E.Br.	Iridaceae	5	1
<i>Chorispota tenella</i> (Pall.) DC.	Brassicaceae	1	1
<i>Corispermum marschallii</i> Steven	Chenopodiaceae	3	1
§ <i>Cortaderia selloana</i> (Schult. & Schult.f.) Asch. & Graebn.	Poaceae	16	2
<i>Cotula coronopifolia</i> L.	Asteraceae	4	3
<i>Cyperus congestus</i> Vahl	Cyperaceae	3	1
<i>Cyperus microiria</i> Steud.	Cyperaceae	7	3
<i>Cyperus squarrosus</i> L.	Cyperaceae	4	1
<i>Cyperus strigosus</i> L.	Cyperaceae	4	1

Species	Family	Number of region in which the species occurs	Number of regions with impacts on plant communities
<i>Dichanthelium acuminatum</i> (Sw.) Gould & C.A.Clark subsp. <i>implicatum</i> (Scribn.) Freckmann & Lelong	Poaceae	3	1
* <i>Diplachne fascicularis</i> (Lam.) P. Beauv.	Poaceae	3	1
<i>Echinochloa hispidula</i> (Retz.) Nees	Poaceae	4	1
<i>Egeria densa</i> Planch.	Hydrocharitaceae	6	1
<i>Elaeagnus pungens</i> Thunb.	Elaeagnaceae	10	2
<i>Eleocharis obtusa</i> (Willd.) Schult.	Cyperaceae	5	1
<i>Eragrostis curvula</i> (Schrud.) Nees	Poaceae	7	1
<i>Heteranthera reniformis</i> Ruiz & Pav.	Pontederiaceae	6	2
<i>Humulus japonicus</i> Siebold & Zucc.	Cannabaceae	6	2
<i>Ligustrum japonicum</i> Thunb.	Oleaceae	6	1
<i>Ligustrum ovalifolium</i> Hassk.	Oleaceae	8	3
<i>Lindernia dubia</i> (L.) Pennell	Linderniaceae	7	4
<i>Melia azedarach</i> L.	Meliaceae	12	1
<i>Mirabilis nyctaginea</i> (Michx.) MacMill.	Nyctaginaceae	3	0
<i>Miscanthus sinensis</i> Andersson	Poaceae	3	1
<i>Mollugo verticillata</i> L.	Molluginaceae	4	2
<i>Muhlenbergia schreberi</i> J.F.Gmel.	Poaceae	5	1
<i>Murdannia keisak</i> (Hassk.) Hand.-Mazz.	Commelinaceae	2	2
<i>Najas gracillima</i> (A.Braun ex Engelm.) Magnus	Hydrocharitaceae	4	1
<i>Nelumbo nucifera</i> Gaertn.	Nelumbonaceae	6	5
<i>Nonea pulla</i> (L.) DC.	Boraginaceae	3	0
<i>Oenothera adriatica</i> Soldano	Onagraceae	5	2
<i>Oenothera depressa</i> Greene	Onagraceae	3	1
<i>Oenothera fallacoides</i> Soldano & Rostański	Onagraceae	8	1
<i>Oenothera oakesiana</i> (A.Gray) J.W.Robbins ex S.Watson & J.M.Coult.	Onagraceae	4	2
<i>Oenothera pedemontana</i> Soldano	Onagraceae	3	1
<i>Oenothera sesitensis</i> Soldano	Onagraceae	4	3
<i>Opuntia dillemii</i> (Ker Gawl.) Haw.	Cactaceae	7	1
<i>Opuntia engelmannii</i> Salm-Dyck ex Engelm.	Cactaceae	7	1
<i>Opuntia monacantha</i> Haw.	Cactaceae	9	2
<i>Opuntia phaeacantha</i> Engelm.	Cactaceae	7	2
<i>Parkinsonia aculeata</i> L.	Fabaceae	6	1
<i>Persicaria filiformis</i> (Thunb.) Nakai	Polygonaceae	2	2
<i>Persicaria nepalensis</i> (Meisn.) H.Gross	Polygonaceae	4	3
<i>Persicaria pensylvanica</i> (L.) M.Gómez	Polygonaceae	7	2
<i>Persicaria virginiana</i> (L.) Gaertn.	Polygonaceae	1	2
<i>Phyllostachys viridiglaucescens</i> (Carrière) Rivière & C.Rivière	Poaceae	5	1
<i>Pistia stratiotes</i> L.	Araceae	6	1
<i>Prunus serotina</i> Ehrh.	Rosaceae	7	3
<i>Pseudosasa japonica</i> (Siebold & Zucc. ex Steud.) Makino ex Nakai	Poaceae	6	1
<i>Pseudotsuga menziesii</i> (Mirb.) Franco	Pinaceae	8	1
‡ <i>Quercus rubra</i> L.	Fagaceae	9	6
‡ <i>Reynoutria bohemica</i> Chrtek & Chrtková	Polygonaceae	9	4
<i>Robinia viscosa</i> Vent.	Fabaceae	1	1
<i>Rosa rugosa</i> Thunb.	Rosaceae	5	1
<i>Rubus phoenicolasius</i> Maxim.	Rosaceae	5	2
<i>Sagittaria latifolia</i> Willd.	Alismataceae	5	3
* <i>Salvinia molesta</i> D.S.Mitch.	Salviniaceae	3	0
‡ <i>Senecio inaequidens</i> DC.	Asteraceae	20	18
* <i>Setaria pycnocomia</i> (Steud.) Henrard ex Nakai	Poaceae	12	2
‡ <i>Sicyos angulatus</i> L.	Cucurbitaceae	14	8
<i>Solanum carolinense</i> L.	Solanaceae	7	1
<i>Solanum sisymbriifolium</i> Lam.	Solanaceae	4	2
<i>Spiraea japonica</i> L.f.	Rosaceae	7	4
<i>Sporobolus neglectus</i> Nash	Poaceae	6	3
<i>Sporobolus vaginiflorus</i> (Torr. ex A.Gray) Alph.Wood	Poaceae	6	4
<i>Sporobolus ×townsendii</i> (H.Groves & J.Groves) P.M.Peterson & Saarela	Poaceae	1	0

<i>Trachycarpus fortunei</i> (Hook.) H.Wendl.	Arecaceae	11	6
[§] <i>Tradescantia fluminensis</i> Vell.	Commelinaceae	15	4
<i>Vachellia karroo</i> (Hayne) Banfi & Galasso	Fabaceae	7	1
* <i>Viola cucullata</i> Aiton	Violaceae	6	1
<i>Washingtonia filifera</i> (Linden ex André) H.Wendl. ex de Bary	Arecaceae	4	1

*The nomenclature of these species is not in accordance with Galasso et al. (2018); correspondence is as follows: *Diplachne fascicularis* (Lam.) P. Beauv. = *Diplachne fusca* (L.) P.Beauv. ex Roem. & Schult. subsp. *fascicularis* (Lam.) P.M.Peterson & N.Snow, *Salvinia molesta* D.S.Mitch. = *Salvinia adnata* Desv., *Setaria pycnocomma* (Steud.) Henrard ex Nakai = *Setaria italica* (L.) P.Beauv. subsp. *pycnocomma* (Steud.) de Wet, and *Viola cucullata* Aiton = *Viola sororia* Willd.

FIGURES

Figure 1. Operational flow chart applied to the National Alien Species Data Base in order to select the list of candidate species to submit to the national prioritization procedure to be included in a national list according to Regulation (EU) n. 1143/2014.

