A first checklist of the alien-dominated vegetation in Italy

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Abstract

This study provides a first step toward the knowledge of the alien-dominated and co-dominated plant communities present in Italy. The first ever checklist of the alien phytocoenoses described or reported in literature for the Italian territory has been compiled, produced by data-mining in national and local thematic literature. The resulting vegetation-type draft-list has been checked in the light of the most recent syntaxonomic documentation and updated with regards to syntaxonomy and nomenclature, with special reference to the frame proposed in the Italian Vegetation Prodrome. The list includes 27 vascular and one bryophyte vegetation classes, hosting 194 low rank alien-dominated syntaxa. The different vegetation types detected for each syntaxonomic class and macro-vegetation group, defined by physiognomical and ecological attributes, are discussed.

Keywords

biodiversity, conservation, habitat, Invasive Alien Species, phytosociology, plant communities, syntaxonomy, threats

Introduction

Biological invasions are an ever-increasing global process arising from the intentional or accidental human-mediated introduction of species to areas outside their native range, overcoming natural dispersal mechanisms and biogeographic barriers (Richardson and Pyšek 2006; Blackburn et al. 2014; Seebens et al. 2018).

The consideration and debate on Invasive Alien Species (IAS) date back to long ago (Allan 1936; Egler 1942; Baker 1948; Elton 1958). In the last few decades, invasion science has emerged, becoming a relevant discipline of its own (Richardson et al. 2000; Richardson and Pyšek 2006; Richardson 2011), also as a consequence of the increasing rates of alien species’ introductions at the global scale (Seebens et al. 2017, 2018) with no exception in Europe (DAISIE 2009) and in the Mediterranean (Hulme et al. 2008).

Biological invasions are nowadays widely recognized as an important component of human-induced global environmental change (Vitousek et al. 1997; Parmesan and Yohe 2003; Vilà et al. 2011; Vilà and Hulme 2017), being the second most common threat associated to species that underwent extinction in recent times (Bellard et al. 2016). Despite the accumulation of rigorous evidence of its importance to science and society, invasion biology has been the target of criticisms from scientists and academics who do not agree on the role of alien taxa as one of the greatest extinction threat at global scale (Davis 2011; Richardson and Ricciardi 2013; Pearce 2015; Russell and Blackburn 2017; Ricciardi and Ryan 2018). However, it is renowned that the establishment and spread of IAS can drastically affect the native biodiversity by changing community composition, biotic interactions and other ecosystem processes (Vilà et al. 2011; Pyšek et al. 2012; Vilà and Hulme 2017), as well as by replacing it with common and widespread taxa (McKinney and Lockwood 1999; Hahs and McDonnell 2016), and can promote alternative successional trajectories that may dramatically affect the landscape (Williamson 1996; McKinney and Lockwood 1999; Weber 2003; Acosta et al. 2007; Del Vecchio et al. 2013; Gaertner et al. 2014; Stinca et al. 2015; Malavasi et al. 2018).

An alien organism needs to overcome geographical, environmental, and reproductive barriers to colonize a new region and spread over wide areas. In this process, some factors and traits can be more significant than others in explaining its success and therefore its invasiveness (Van Kleunen et al. 2015). Particularly, the concept of invasiveness of plant species has been integrated with that of propagule pressure and of “invasibility” of habitats and plant communities, i.e. the susceptibility of an environment to invasions by alien species, as different habitats and phytocoenoses may be more invasive than others and show different degrees of resistance/resilience (Rejmánek 1989; Lonsdale 1999; Rejmánek et al. 2005; Richardson and Pyšek 2006). All these concepts have been included in
the unifying theory of invasion syndromes (Perkins and Nowak 2013).

Patterns of distribution and abundance of IAS depend on a number of drivers including introduction history and pathways, life traits, availability of potentially invasible ecosystems, presence of vegetation, disturbance (Wilson et al. 2007; Carranza et al. 2010; Richardson et al. 2011; Comin et al. 2011; Dainese and Poldini 2012; Jucker et al. 2013). It is acknowledged that anthropogenic drivers play a crucial role in the establishment and spread of alien species (Pyšek and Richardson 2006; Pyšek et al. 2010a, 2010b; Bolpagni and Piotti 2015; Lazzaro et al. 2017; Stonca et al. 2017), however alien species showed to be largely constrained also by the same broad environmental factors acting on the native vegetation (Rouget et al. 2015). The same applies to IAS populations as well, as it has been demonstrated that what is good for natives is good for aliens too (Pyšek and Richardson 2006; Dalle Fratte et al. 2019).

Vascular plants are the most investigated taxonomic group in the field of invasive biology, and Europe devoted great efforts to their study, being the second continent (after North America) for investigative endeavour on plant invasions (Pyšek et al. 2009; Early et al. 2016). However, in spite of a huge scientific production about alien species numbers, ecology, impacts and distribution (for a synthesis at the European level, see DAISIE 2009 and Galasso et al. 2018 for Italy), their patterns and co-occurrence dynamics have only recently started to be in the spotlight, together with the factors driving alien plant assemblages (Hui et al. 2013; Pyšek and Chytrý 2014; Rouget et al. 2015).

A number of studies addressed the key role of cover and dominance of alien species to understand the invasion patterns (Lundholm and Larson 2004; Smith et al. 2004; Crall et al. 2006; Chytrý et al. 2008, 2009; Pyšek et al. 2010a, 2010b). This seems to some extent more important than alien species number, suggesting the hypothesis that the more an alien taxon becomes dominant in a vegetation type, the stronger the impact on native species diversity might be. This approach gave a pulse to research on alien plant species assemblages, and recently investigations on IAS have been addressed also at the community scale and benefited from the currently available large databases of vegetation plots (see, e.g., Dengler et al. 2011; Landucci et al. 2012; Del Vecchio et al. 2015; Chytrý et al. 2016; Sperandii et al. 2018; Bonari et al. 2019).

A study by Chytrý et al. (2008) demonstrated that the habitat type is a reliable predictor of the level of plant invasion. This paper took into account patterns of plant invasions across habitats at the European scale, suggesting precious insights for biodiversity conservation and habitat monitoring, especially when considering the acknowledged correspondence between syntaxonomic types and habitats sensu Dir. 92/43/EEC (European Commission 1992, 2013; Evans 2010; Biondi et al. 2012; Viciani et al. 2016). Indeed, alien species have been listed among the causes of habitat decline and loss also in the most recent red-list assessments, both at European (Janssen et al. 2016) and Italian scale (Gigante et al. 2018).

Some authors started to qualify and quantify the role of alien species in different vegetation and habitat types, and to point out the functional role that alien species play in plant communities (Celesti-Grapow et al. 2010; Pyšek and Chytrý 2014; Prisco et al. 2016). Moreover, habitat misclassification can be favoured by the presence of alien species (Sarmati et al. 2019). However, to date only few studies focussed on alien-dominated plant communities and the role of aliens in natural assemblages. With notable exceptions (e.g. Jurko 1964; Hadáč and Sofron 1980; Ubaldi 2003; Vítková and Kolbek 2010; Sirbu and Oprea 2011; Allegrezza et al. 2019), the large majority of vegetation studies, especially outside Europe, are still mostly focused on natural and semi-natural phytocoenoses with few or no aliens (Chytrý et al. 2009; Pyšek and Chytrý 2014).

Despite a long-dated Italian tradition of phytosociological studies, a national synthesis of the alien-dominated (and co-dominated) plant communities thriving in Italy has never been produced yet. Therefore, the present research aims at taking the first step toward the filling of this knowledge gap.

The European and national projects dedicated to IAS, which involved and currently still involve research academic centres and institutions, are numerous in Italy. Some of them have helped to gather a significant amount of information on invasive plant and animal species. Among the most recent, addressing non-native plant species, their impact and their management, as well as the awareness of the general public on these topics, we can mention: LIFE ASAP (http://www.lifasap.eu), LIFE GESTIRE IP2020 (http://www.naturachevale.it/il-progetto/life-gestire-2020/), LIFE REDUNE (http://www.liferedune.it), MARITTIMO ALIEM (http://interreg-maritime.eu/web/aliem/).

The present work is the result of a research agreement between SISV (the Italian Society for Vegetation Science) and ISPRA (the Italian Institute for Environmental Protection and Research), with financial support from the Italian Ministry of Environment, aimed at supporting the implementation of Regulation EU 2014/1143 (updated by EU Reg. 2017/1263) on the prevention and management of the introduction and spread of invasive alien species. In particular, the general agreement focused on: i) the update of the Database of Italian Alien Species (DIAS) with reference to their impacts on the ecosystems and the most threatened habitats and ii) the identification of the alien-dominated or co-dominated plant communities occurring in Italy. The outcomes of the latter are here presented. The research on alien plant communities and habitats was carried out through the collaboration of a wide working group of experts led by a Coordinating Committee composed by SISV members.
Methods

A dedicated SISV working team, formed by national and local experts, collected all the thematic literature related to terrestrial and freshwater alien-dominated and co-dominated vegetation. On the basis of this bibliographic dataset, a selection of all vegetation data was carried out, with special attention to nomenclature and syntaxonomic classification. All the existing national and regional vegetation databases (e.g., LiSy – http://www.scienzadellavegetazionedonne.it/sisy/lisy/index.jsp; Poldini et al. 1985; Poldini 1991, 2002, 2009; Gallizia Vuerich et al. 1999; Brullo et al. 2001; Gigante et al. 2012; Landucci et al. 2012; Evangelista et al. 2016), together with the regional bibliographic sources (e.g., Poldini 1989; Poldini and Vidali 1989; Poldini et al. 1991, 1999), were consulted. Data concerning each phytocoenosis were selected if one or more alien species played a substantial role in the analysed vegetation unit. In particular, the SISV Coordinating Committee collected and checked the information and selected the data whenever:

1. the analysed low rank syntaxon (association, subassociation, phytocoenon) was dominated or co-dominated by one or more alien plant species; a cover value ≥ 3 according to the "Braun-Blanquet" scale (Braun-Blanquet 1979) for alien species cover in each relevé has been set as threshold; if, instead of the "Braun-Blanquet" scale, the "Pignatti" scale was used in the bibliographical reference (Pignatti and Mengarda 1962), the cover value threshold was set to ≥ 2, i.e. 20-40%;
2. the alien species name was included in the name of the syntaxon, by that implying that it is a characteristic/differential/diagnostic or somehow important taxon for the definition of the syntaxon, or even dominating and determining its vertical structure (as stated in Art. 10b of the International Code of Phytosociological Nomenclature: Theurillat et al. 2020).

Starting from this selected dataset, a draft syntaxonomic list was produced. The names of the plant communities and their syntaxonomic attributions at higher ranks have been acknowledged (and are here reported) in the same form as published by the original Authors. In case of inconsistencies or discrepancies, a specific comment has been provided.

The syntaxonomic scheme has then been updated in accordance with the Italian Vegetation Prodrome (Biondi et al. 2014; http://www.prodromo-vegetazione-italia.org/), which however does not take into considerations syntaxa below the alliance level. Relevant differences and discrepancies with other syntaxonomic frames, especially regarding the EuroVegChecklist (Mucina et al. 2016), have been commented.

Plant nomenclature in the text follows the Checklists of the vascular flora of Italy (Bartolucci et al. 2018; Galasso et al. 2018) and later updates reported in the "Portal to the flora of Italy" (http://dryades.units.it/floritaly/index.php), to which we referred also to identify the species to be considered as aliens to Italy, including archaeophytes (e.g. Arundo donax, Acanthus mollis subsp. mollis) as well. New hybridogenic species due to xeno-speciation events (e.g. some species of Oenothera or Vitis) were taken into account, when considered as alien taxa by Galasso et al. (2018). In case of species considered alien to an administrative region and native to another one, only the communities reported for the region where the species is alien have been recorded (e.g., a community dominated by Acanthus mollis subsp. mollis was considered alien to Liguria but not to Sicily, where this species is considered as native, see Minissale et al. 2019).

This process allowed to produce a first checklist of the Italian alien-dominated plant communities. On this ground, some statistics were calculated considering the number of alien vegetation units with reference to i) each resulting syntaxonomic class and ii) homogeneous groups of the resulting syntaxonomic classes, clustered according to their physiognomic and ecological characteristics.

Results and discussion

A comprehensive and annotated checklist of the alien-dominated and co-dominated plant communities occurring in Italy is provided in Appendix I. All phytocoenoses have been framed in an updated syntaxonomic scheme. A specific bibliographical list with references for all the syntaxa quoted in the checklist is available in Appendix II.

The checklist includes a total of 27 classes of vascular plant vegetation and one of bryophyte vegetation, including plant communities dominated or co-dominated by aliens to Italy. The total number of low rank syntaxa (associations/subassociations/communities) amounts to 194.

The number of communities for each class is reported in Fig. 1. As expected, the class with the highest number of alien-dominated plant communities resulted by far Stellarietalia mediae, followed by Artemisetalia vulgaris. The presence of some higher-rank syntaxa named after and mainly formed by IAS (e.g., the class Robinietea, the order Nicotiano glaucae-Ricinetaalia communis) is worth to be noted, which highlights the coenological and physiognomic-structural autonomy of these communities.

The 27 identified classes and some subordinate syntaxa have been grouped in clusters based on their physiognomy and ecology. The considered groups are as follows:

- Forest vegetation (Querco-Fagetalia, Quercetalia ilicis);
- Anthropogenic woody vegetation (Robinietea and part of Rhamno-Prunetea);
- Alluvial, marshy and riparian woody vegetation (Alnetea, Salici-Populetea, Salicetea, Alnion incanae);
- Perennial herbaceous hygrophilous and hygro-nitrophilous vegetation (Galio-Urticetea, Filipendulo-Convulvuletalia, Molinio-Arrhenatheretea, Phragmito-Magnocaricetea);
Perennial ruderal herbaceous vegetation (Artemisietea);
Annual ruderal herbaceous vegetation (Stellarietea, Polygono arenastri-Poetea annuae);
Annual herbaceous hygro-nitrophilous vegetation (Bidentetea);
Hydrophitic freshwater vegetation (Potametea, Lemnetea);
Psammophilous vegetation (Euphorbio-Ammophiletea, Cakiletea, Helichryso-Crucianelletea).

Results of the community rates per class groups are shown in Fig. 2. The group including the classes of annual ruderal herbaceous vegetation (Stellarietea mediae and Polygono arenastri-Poetea annuae) hosts about 25% of the total number of the detected alien-dominated communities. *Stellarietea mediae* is by definition characterized by high rates of alien plant species, especially archaeophytes (http://www.prodrromo-vegetazione-italia.org/). However, data analysis showed that this explains only part of the story. Actually, the involved alien species and genera are mainly represented by neophytes (e.g. *Robinia pseudoacacia*, *Artemisia* sp.pl., *Amaranthus* sp.pl., *Erigeron* sp.pl., *Euphorbia* sp.pl., *Solidago* sp.pl.). Indeed, it is known that neophytes mostly occur in strongly anthropogenic areas, whose habitats appear to be not only the most invaded, but also the most invisible (Pyšek et al. 2002, 2005; Deuschewitz et al. 2003; Kühn et al. 2003; Chytrý et al. 2008). On the contrary, relatively low- or non-anthropized ecosystems, such as nutrient-poor environments or montane habitats, are least or not invaded (Chytrý et al. 2008; Angiolini et al. 2019). For these reasons, heavily human-impacted environments (i.e. arable lands and fallow fields, urban and industrial areas, aquatic and riparian habitats) show the highest levels of neophyte invasion, as already suggested by previous studies, at least in continental areas (Kowarik 1995; Walter et al. 2005; Richardson and Pyšek 2006; Chytrý et al. 2009; Myśliwy 2014) and, as a consequence, the highest number of alien-dominated plant communities (Bolpagni and Piotti 2015).

Also the coastal areas are highly impacted by IAS (Acosta et al. 2007; Carboni et al. 2010; Del Vecchio et al. 2013, 2015; Lazzaro et al. 2017). Indeed, the close connection between invasibility, propagule pressure and habitat disturbance is a widely accepted relationship (Di Castri 1990; Vitousek et al. 1997; Pino et al. 2006; Perkins and Nowak 2013). This is indirectly confirmed in this study, by the fact that many of the less represented groups of alien-dominated communities refer to scarcely invasible environments, such as screes (*Thlaspietea rotundifolii*) or Mediterranean grass-dominated vegetation (*Lygeo-Stipeetea*). Unexpectedly, our data seem to suggest that psammophilous coastal vegetation experiences low rates of

![Figure 1. Number of alien-dominated communities for each syntaxonomic class of the checklist reported in Appendix I.](image-url)
alien community occurrence (Figs. 1, 2). However, to correctly interpret this outcome, it should be considered that the collected data might outline a biased picture due to a lack of syntaxonomic investigation and classification for some communities. In support of this hypothesis, it should be noted that many alien coastal communities dominated by Ailanthus altissima, Robinia pseudoacacia, Amorpha fruticosa, and many others) can be defined as “ecosystem engineers”, i.e. species that shape habitats and/or cause changes to their state and resources availability (Vitousek 1986; Schmitz et al. 1997; Jones et al. 1997; Crooks 2002; Bašnou and Vilá 2009; Djurdjevic et al. 2011; Benesperi et al. 2012; Cierjacks et al. 2013; Vitková et al. 2017; Lazzaro et al. 2018). The replacement of native species by alien plants, even when apparently ecologically equivalent, almost always negatively affects the ecosystems, especially if those species act as “ecosystem engineers” (Brown et al. 2006; Wilson and Ricciardi 2009; Lazzaro et al. 2018; Sitzia et al. 2018; Uboni et al. 2019).

In the checklist we also recorded a bryophyte community dominated by the alien Campylopus introflexus, which in Europe is considered a neophytic moss, introduced from the Southern hemisphere and rapidly expanding (Hill et al. 2006). It was detected along Mediterranean ponds and neighbouring wood glades (Cogoni et al. 2002; Puglisi et al. 2016; Poponessi et al. 2016, 2018) and its distribution deserves to be monitored.

Few considerations can be made on the number of alien species involved in the communities reported in the checklist. According to Galasso et al. (2018), there are 791 non-native naturalized species in the Italian territory, 221 of which are considered invasive in at least one region. Our checklist shows that, based on the current knowledge, less than one hundred of these species (precisely 88) perform a dominant or co-dominant role in the considered plant communities. Only five of these (Ailanthus altissima, Elo-dea nuttallii, Lagarosiphon major, Myriophyllum aquaticum, Cerchus setaceus) are considered IAS of Union Concern (see https://ec.europa.eu/environment/nature/invasivealien/list/index_en.htm), however this number grows considerably when downsampling at the national level, with 76 of them (i.e. more than 86% of the total) to be considered as IAS in Italy (Galasso et al. 2018). Again, this can be traced back to the fact that most of these IAS are neophytes, many have been introduced in relatively recent times, and probably there was not enough time to give rise to such a degree of invasion to be relevant at European scale yet. Additionally, also at the national scale these invasions are often very localized or at very early stages, and their study from the phytosociological point of view is still a minor topic (although emergent).

At the same time, the continuous rate of introduction-naturalisation-invasion of new alien plants is an ongoing process that should be detected just in early stages, in order to prevent serious damage to native biodiversity. The numbers here reported raise the alarm for planning conservation biodiversity studies, monitoring protocols and management activities.

Conclusion

The here presented first checklist of the alien-dominated plant communities in Italy should not be considered exhaustive. It is the first step toward a better understanding
of distribution, ecology and invasion processes of alien species at community level in this country. Our review represents a screenshot of the current knowledge and suggests that a serious lack of investigation for certain vegetation types (and probably for certain areas of the country) has to be highlighted.

The present checklist of the alien vegetation in Italy can represent a very useful tool, not only for stimulating further studies and investigations but also for prevention, management and monitoring purposes. As emphasized by Olaczek (1982), the phytosociological school, taking into account the whole floristic composition of plant communities, was one of the first approaches able to detect the effects of alien species on the diversity of natural phytocoenoses and to include these new communities in the syntaxonomical vegetation classification. In fact, the "floristic and phylogenetic homogenization" (e.g. Pino et al. 2009) and the "degeneration of phytocoenoses" by means of a progressive modification of structure and floristic composition due to the alien species invasion, concepts expressed by Olaczek (1982) and Faliński (1998a, 1998b), can transform a native plant community into an anthropogenic one, or even in a "novel ecosystem" (Lugo 2015), susceptible to be classified in a new syntaxonomic frame.

This becomes particularly important when considering the close link between plant communities syntaxonomically described and Natura 2000 habitat types, as listed in the Annex I to the Directive 92/43/EEC (European Commission 1992, 2013). It is mandatory for Member States to conserve Annex I habitats in Europe in a favourable conservation status (Evans 2012; Gigante et al. 2016). Undoubtedly, a better understanding of the processes by which a plant community and a habitat type are firstly invaded and then dominated by alien species, together with the comprehension of the successional (and syntaxonomic) implications of those processes, can effectively support the monitoring and management of biodiversity and protected areas.

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Appendixes

Appendix I – Alien-dominated and co-dominated plant communities in Italy (Syntaxa authors are abbreviated according to Izco 2002)

| Class | Order | Alliance | Association/Phytocoenon | Reference number in the specific bibliographical list of Supplement I |
|-------|-------|----------|-------------------------|--------------------------|

2 LEMNETEA MINORIS O. Bolòs & Masclans 1955

2.1 LEMNETALIA MINORIS O. Bolòs & Masclans 1955

*Lemma minuta* community

2.1.1 Lernion minoris O. Bolòs & Masclans 1955

*Azollo filiculoidis-Lemnetum minuscolae* Felzines & Loiseau 1991 82, 83, 90

*Ceratophyllo-Azolletum filiculoidis* Nedelcu 1967 56, 58

*Lemma minuta* community 110

*Lemnetum minuto-gibbae* Liberman Cruz, Pedrotti & Venanzoni 1988 56

*Lemno-Azolletum filiculoidis* Br.-Bl. 1952 40, 115

3 POTAMETEA PECTINATI Klika in Klika & V. Novák 1941

3.1 POTAMETALIA PECTINATI Koch 1926

3.1.1 Potamion pectinati (Koch 1926) Libbert 1931

*Callitricho-Elodeetum canadensis* Passarge 1964 ex Passarge 1994 39

*Elodea canadensis* and *Potamogeton crispus* community 91

*Elodea nuttallii* community 28

*Elodeo-Potametum crispi* (Pignatti 1953) Passarge 1994 40

*Elodeo-Ranunculetum* Richard 1975 114

*Lagarosiphon major* community 28

*Myriophyllum aquaticum* community 64

*Potametum crispi* Soó 1927 *Myriophyllum aquaticum* variant 64

*Potametum lucentis* Hueck 1931 *Lagarosiphon major* variant 116

3.1.2 Nymphaeion albae Oberdorfer 1957

*Hydrocotyletum ranunculoidis* Corbetta & Lorenzoni 1976 42
| Class | Order | Alliance | Association/Phytocoenon | Reference number in the specific bibliographical list of Supplement 1 |
|-------|-------|----------|------------------------|---------------------------------------------------------------|
|       |       |          | 3.1.3 Ranunculion aquatilis Passarge 1964 |
|       |       |          | Callitriches stagneris and Myriophyllum aquaticum community |
|       |       |          | Lemna-Callitrichetum cophocarpae (Mierwald 1988) Passarge 1992 |
|       |       |          | Myriophyllum aquaticum variant |
| 12    | BIDENTEAE TRIPARTITAE Tüxen, Lohmeyer & Preising ex Von Rochow 1951 |
| 12.1  | BIDENTETALIA TRIPARTITAE Br.-Bl. & Tüxen ex Klika in Klika & Hadac 1944 |
| 12.1.1| Bidention tripartitae Nordhagen 1940 |
|       |       |          | Bidens frondosus community |
|       |       |          | Bidenti-Polygonetum mitis (Von Rochow 1951) Tüxen 1979 |
|       |       |          | Bidens frondosa variant |
|       |       |          | Bidenti-Polygonetum mitis (Von Rochow 1951) Tüxen 1979 |
|       |       |          | echinocloetosum crus-galli Baldoni & Biondi 1993 |
|       |       |          | Polygonetum hydropiperis Passarge 1965 Bidens frondosus facies |
|       |       |          | Xanthio italic-Polygonetum persicariae O. Bolos 1957 |
|       |       |          | Xanthio italic-Persicarietum maculosae O. Bolos 1957 nom. mut. propos. |
|       |       |          | Abutilon theophrasti variant |
|       |       |          | Xanthium orientale subsp. italicum community |
| 12.1.2| Chenopodion rubri (Tüxen 1960) Hilbig & Jage 1972 |
|       |       |          | Cyperetum esculenti \(\text{Wisskirchen 1995}\) |
|       |       |          | \(\text{Polygono-Xanthietum italic}\) Pirola & Rossetti 1974 |
|       |       |          | \(\text{Polygono-Xanthietum italic}\) Pirola & Rossetti 1974 |
|       |       |          | \(\text{Ambrosia artemisifolia}\) variant |
| 16    | PHRAGMITO AUSTRALIS-MAGNOCARICETEA ELATAE Klika in Klika & V. Novák 1941 |
| 16.1  | PHRAGMITETALIA AUSTRALIS Koch 1926 |
| 16.1.1| Phragmition communis Koch 1926 |
|       |       |          | \(\text{Scirpetum maritimi}\) (Christiansen 1934) Tüxen 1937 |
|       |       |          | \(\text{Paspalum distichum}\) variant |
| 16.3  | MAGNOCARICETALIA ELATAE Pignatti 1953 |
| 16.3.1| Magnocaricion elatae Koch 1926 |
|       |       |          | \(\text{Cyperus eragrostis}\) community |
|       |       |          | \(\text{Cyperus glomeratus}\) community |
| 16.5  | NASTURTIO OFFICINALIS-GLYCERIETALIA FLUITANTIS Pignatti 1953 |
| 16.5.1| Glycerio fluitantis-Sparganiion neglecti Br.-Bl. & Sissingh in Boer 1942 |
|       |       |          | \(\text{Eleocharitetum palustris}\) Schennikov 1919 |
|       |       |          | \(\text{paspaletosum paspaloidis}\) Biondi et al. 2002 |
| 20    | EUPHORBIO PARALIAE-AMMOPHILETEA AUSTRALIS Géhu & Rivas-Martinez in Rivas-Martínez, Asensi, Diaz-Garretas, Molero, Valle, Cano, Costa & T.E. Díaz 2011 |
| 20.1  | AMMOPHILETALIA AUSTRALIS Br.-Bl. 1933 |
| 20.1.1| Ammophilion australis Br.-Bl. 1933 em. Géhu & Géhu-Franck 1988 |
|       |       |          | \(\text{Carpobrotus acinaciformis}\) community |
| Class | Order | Alliance | Association/Phytocoenon | Reference number in the specific bibliographical list of Supplement 1 |
|-------|-------|----------|------------------------|-------------------------------------------------------------------|
|       |       |          | Carpobrotus edulis community | 88 |
|       |       |          | Xanthium-Ammophiletum Pignatti 1953 | 91 |

21 CABLETEA MARITIMAE Tüxen & Preising ex Br.-Bl. & Tüxen 1952

|       |       |          | 21.1 EUPHORBIETALIA PEPLIS Tüxen 1950 |
|-------|-------|----------|--------------------------------------|
|       |       |          | 21.1.1 Euphorbion peplus Tüxen 1950   |
|       |       |          | Cakilo-Xanthietum italici Pignatti 1953 | 1, 9, 12, 38, 91, 93 |
|       |       |          | Salsolo kali-Xanthietum maritimae Costa et Mansanet 1981 corr. Rivas-Martinez et al. 1992 | 17, 24, 48, 70, 91,106 |
|       |       |          | Xanthio italici-Cenchrion incerti Biondi, Brugiaaglia, Allegrezza & Ballelli 1992 | 24, 100, 109 |
|       |       |          | Xanthio italici-Cenchrion longispini Poldini et al. 1999 | 100, 106 |

22 HELICRYSO-CRUCIANELLETALIA MARITIMAE (Sissingh 1974) Géhu, Rivas-Martinez & & Tüxen 1973 em. Sissingh 1974

|       |       |          | 22.1 HELICRYSO-CRUCIANELLETALIA MARITIMAES Géhu, Rivas-Martinez & & Tüxen 1973 em. Sissingh 1974 |
|-------|-------|----------|--------------------------------------|
|       |       |          | 22.1.1 Crucianellion maritimae Rivas Goday & Rivas-Martinez 1958 |
|       |       |          | Crucianello-Helichrysetum microphylli Bartolo, Bruullo, De Marco, Dinelli, Signorello & Spampinato 1992 Carpobrotus acinaciformis variant | 125 |
|       |       |          | Ephedro-Helichrysetum microphylli Valsecchi & Bagella 1991 Carpobrotus acinaciformis variant | 125 |

31 PARIERIETALIA JUDAICAE Oberdorfer 1977

|       |       |          | 31.1 TORTULO-CYMBALARIELTALIA Segal 1969 |
|-------|-------|----------|--------------------------------------|
|       |       |          | 31.1.1 Parietarion judaicae Segal 1969 |
|       |       |          | Cheiranthenum cheirii Segal 1962 | 46 |
|       |       |          | Erigeronnetum karvinskian Oberdorfer 1969 | 46, 54, 70 |

33 TLASPIETALIA ROTUNDIFOLII Br.-Bl. 1948

|       |       |          | 33.6 EPILOBIETALIA FLEISCHERI Moor 1958 |
|-------|-------|----------|--------------------------------------|
|       |       |          | Oenothera biennis and Scrophularia canina community | 114 |

34 ARTEMISIETALIA VULGARIS Lohmeyer, Preising & Tüxen ex Von Rochow 1951

|       |       |          | 34 ARTEMISIETALIA VULGARIS Lohmeyer, Preising & Tüxen ex Von Rochow 1951 |
|-------|-------|----------|--------------------------------------|
|       |       |          | Sporobolus vaginiflorus community | 104 |
|       |       |          | Senecio mikanoides community | 101 |
|       |       |          | Helianthus tuberosus community | 99, 104 |
|       |       |          | Solidago gigantea community | 70, 120 |
|       |       |          | Senecio inaequidens community | 99 |

34.1 ARCTIO LAPPAE-ARTEMISIETALIA VULGARIS Dengler 2002

|       |       |          | 34.1.1 Arction lappae Tüxen 1937 |
|-------|-------|----------|--------------------------------------|
|       |       |          | Artemisietum verlotorii Lang 1973 | 41, 99, 101 |
|       |       |          | Arundo donax community | 43 |
|       |       |          | Saponario-Artemisietum verlotorium Biondi & Baldoni 1993 | 15, 63, 72 |
|       |       |          | Sileno albae-Acanthetum mollis Biondi, Allegrezza & Filigheddu 1990 | 21 |
| Class  | Order  | Alliance                  | Association/Phytocoenon                        | Reference number in the specific bibliographical list of Supplement 1 |
|--------|--------|---------------------------|-----------------------------------------------|---------------------------------------------------------------|
| 34.2   | AGROPYRETALIA INTERMEDI-REPENTIS Oberdorfer, Müller & Görs in Müller & Görs 1969 |
| 34.2.1 | Convulvulo arvensis-Agropyron repentis Görs 1966 |
|        | Artemisia verlotiorum community                  | 13, 127                                       |
|        | Sorghum halepense community                      | 46                                             |
| 34.4   | BRACHYPODIO RAMOSI-DACTYLETALIA HISPANICAe Biondi, Filigheddu & Farris 2001 |
| 34.4.4 | Bromo-Oryzopsion miliaceae O. Bolòs 1970 |
|        | Boerhaavia-Oryzopsietum miliaceae Brullo 1984   | 33                                             |
| 34.5   | ONOPORDETALIA ACANTHII Br.-Bl. & Tüxen ex Klika in Klika & Hadač 1944 |
|        | Artemisia verlotiorum community                  | 118                                            |
|        | Helianthus tuberosus community                   | 29                                             |
|        | Senecio inaequidens community                    | 29                                             |
|        | Solidago gigantea community                      | 29                                             |
| 34.5.1 | Onopordion acanthii Br.-Bl. in Br.-Bl., Gajewski, Wraber & Walas 1936 |
|        | Erigeron canadense and Broussonetia papyrfera community | 91                                             |
| 34.5.2 | Dauco carotae-Melilotion albi Görs 1966 |
|        | Artemisia verlotiorum community                  | 47, 118                                        |
|        | Artemisia absinthii-Senecionetum inaequidentis Pirone 2001 | 45, 96                                        |
|        | Echo-Melilotetum Tüxen 1947                      | 30                                             |
|        | Senecio inaequidens and Erigeron annuus variant  | 30                                             |
|        | Echo-Melilotetum Tüxen 1947 Oenothera biennis (aggr.) variant | 31                                             |
|        | Erigeron annuus community                         | 78                                             |
|        | Helianthus tuberosus community                    | 29                                             |
|        | Oenothera biennis community                       | 123                                            |
|        | Senecio inaequidens community                     | 29, 31, 129                                    |
|        | Solidago gigantea community                       | 29                                             |
| 34.6   | CARTHAMETALIA LANATI Brullo in Brullo & Marcenò 1985 |
| 34.6.2 | Onopordion illyrici Oberdorfer 1954 |
|        | Carduo pycnocephali-Nicotianetum glaucae Biondi, Blasi, Brugiapaglia, Fogu & Mossa 1994 | 23                                             |
| 36     | ORYZETEA SATIVAE Miyawaki 1960 |
| 36.1   | CYPERO DIFFORMIS-ECHINOCHOLETALIA ORYZOIDIS O. Bolòs & Masclans 1955 |
| 36.1.1 | Oryzo sativae-Echinochloion oryzoidis O. Bolòs & Masclans 1955 |
|        | Heteranthera sp.pl. community                     | 39                                             |
| 37     | PEGANO HARMALAE-SALSOLETEA VERMICULATAE Br.-Bl. & O. Bolòs 1958 |
| 37.2   | NICOTIANO GLAUCAE-RICINETALIA COMMUNIS Rivas-Martínez, Fernández-González & Loidi 1999 |
| 37.2.1 | Nicotiano glaucae-Ricinietum communis Rivas-Martínez, Fernández-González & Loidi 1999 |
|        | Nicotiano glaucae-Ricinetum communis (Br.-Bl. & Maire 1924) de Foucault 1993 | 37, 87                                        |
|        | Polycarpo-Nicotianetum glaucae Sunding 1972       | 37                                             |
| Class | Order | Alliance | Association/Phytocoenon | Reference number in the specific bibliographical list of Supplement 1 |
|-------|-------|----------|-------------------------|---------------------------------------------------------------|
| 38    | POLYGONO ARENASTRI-POETEA ANNUAEE | Rivas-Martínez 1975 corr. Rivas-Martínez, Báscones, T.E. Diáz, Fernández-González & Loidi 1991 |
|       |       |          | Eleusinetum indicae (Slavnic 1951) Pignatti 1953 | 30 |
|       |       |          | Euphorbio-Oxalidetum corniculatae Lorenzoni 1964 | 30 |
| 38.2  | SAGINO APETALAE-POLYCARPETALIA TETRAPHYLLEI de Foucault 2010 |
| 38.2.1| Polycarpion tetraphylli | Rivas-Martínez 1975 |
|       |       |          | Eleusine indica community | 91 |
|       |       |          | Eleusinetum indicae (Slavnic 1951) Pignatti 1953 | 46, 70, 99, 104 |
|       |       |          | Euphorbietum maculatae Poldini 1989 | 70, 99, 101, 104 |
|       |       |          | Euphorbio-Oxalidetum corniculatae Lorenzoni 1964 | 38, 99, 101 |

39 | STELLARIOETEA MEDIAE Tüxen, Lohmeyer & Preising ex Von Rochow 1951 |
| 39a.3 | SOLANO NIGRI-POLYGONETALIA CONVOLVULI (Sissingh in Westhoff, Dijk, Passchier & Sissingh 1946) O. Bolòs 1962 |
| 39a.3.1 | Digitario ischaemi-Setario viridis | Sissingh in Westhoff, Dijk, Passchier & Sissingh 1946 |
|       |       |          | Amarantho-Chenopodietum albi (Morariu 1943) Soó 1957 | 101 |
|       |       |          | Amarantho-Digitarietum sanguinalis Pignatti 1953 | 67, 71, 91, 101 |
|       |       |          | Chenopodium album and Amaranthus retroflexus community | 99 |
|       |       |          | Cynodonto-Sorghetum halepensis (Laban 1974) Kojic 1979 | 38 |
|       |       |          | Echinochloa-Setarietum pumilae Felföldy 1942 corr. Mucina 1993 xanthietosum italici Poldini et al. 1998 | 105 |
|       |       |          | Oxalido-Chenopodietum polyspermi (Br.-Bl. 1921) Sissingh (1942) 1946 (*) | 66, 67, 91 |
|       |       |          | Oxalido-Chenopodietum polyspermi (Br.-Bl. 1921) Sissingh (1942) 1946 Galinsoga parviflora (*) subassociation | 66 |
|       |       |          | Panico sanguinalis-Polygonetum persicariae Pignatti 1953 sorghetosum halepensis Baldoni 1995 (*) | 14 |
|       |       |          | Panico sanguinalis-Polygonetum persicariae Pignatti 1953 Acalypha virginica (*) facies | 67 |
|       |       |          | Panico sanguinalis-Polygonetum persicariae Pignatti 1953 Echinochloa oryzoides (*) facies | 66 |
|       |       |          | Panico sanguinalis-Polygonetum persicariae Pignatti 1953 Panicum capillare (*) subassociation | 66 |
|       |       |          | Panico sanguinalis-Polygonetum persicariae Pignatti 1953 Datulastramonium and Portulaca oleracea (*) variant | 51 |
|       |       |          | Panico sanguinalis-Polygonetum persicariae Pignatti 1953 Bolboschoenus maritimus and Paspalum distichum (*) variant | 51 |
|       |       |          | Euphorbio-Galinsogetum ciliatae Passarge 1981 | 79 |
|       |       |          | Galeopsis tetrahit-Galinsogetum parviflorae Poldini et al. 1998 | 105 |
|       |       |          | Galinsogo-Portulaccetum Br.-Bl. 1949 ex Pedrotti 1959 | 78, 91 |
|       |       |          | Setario-Echinochloetum colonus A. & O. Bolòs ex O. Bolòs 1956 | 34, 38 |
|       |       |          | Setario-Galinsogetum parviflorae (Beck 1941) Tüxen 1950 em. Müller & Oberdorfer | 70 |
|       |       |          | Setario ambiguae-Cyperetum rotundii Brullo, Scelsi & Spampinato 2001 | 38 |
| 39a.3.3 | Diplotaxion erucoidis | Br.-Bl. in Br.-Bl., Gajewski, Wraber & Walas 1936 em. Brullo & Marcenò 1980 |
|       |       |          | Amaranthus retroflexus community | 86 |
| 39a.3.5 | Fumarion wirgenii-agrairiae | Brullo in Brulo & Marcenò 1985 |
|       |       |          | Oxalis pes-caprae community | 85, 87 |
| Class | Order | Alliance | Association/Phytocoenon | Reference number in the specific bibliographical list of Supplement 1 |
|-------|-------|----------|------------------------|-------------------------------------------------|
| 39b.1 | CHENOPODIETALIA MURALIS | Br.-Bl. in Br.-Bl., Gajewski, Wraber & Walas 1936 |
| 39b.1.1 | Chenopodion muralis | Br.-Bl. in Br.-Bl., Gajewski, Wraber & Walas 1936 |
| | | Amarantho bitoidis-Chenopodietum ambrosioidis O. Bolós 1967 | 46 |
| | | Amarantho muricati-Chenopodietum ambrosioidis O. Bolós 1967 | 34 |
| | | Amarantho-Chenopodietum ambrosioidis O. Bolós 1967 | 34, 38, 99 |
| | | Conyzetum albidae-canadensis Baldoni & Biondi 1993 |
| | | Lolium multiflorum variant | 8 |
| | | Conyzetum albido-canadensis Baldoni & Biondi 1993 | 46, 101 |
| | | Conyzo canadensis-Oenotheretum biennis Biondi, Brugiapaglia, Allegrezza & Ballelli 1992 | 24 |
| | | Xanthio italicis-Daturetum stramoni Fanelli 2002 | 46 |
| | | Amaranthus deflexus and Polycarpion tetraphyllon community | 91 |
| | | Datura stramonium community | 21 |

| 39b.2 | THERO-BROMETALIA | (Rivas Goday & Rivas-Martinez ex Esteve 1973) O. Bolós 1975 |
| 39b.2.1 | Echio plantaginei-Galactition tomentosae | O. Bolós & Molinier 1969 |
| | | Erigeron canadensis community | 121 |
| | | Galacticio-Isatidetum canescentis Brullo 1983 | 32 |

| 39b.3 | SISYMBRIETALIA OFFICINALIS | J. Tüxen ex W. Matuszkiewicz 1962 |
| 39b.3.1 | Sisymbriion officinalis | Tüxen, Lohmeyer & Preising ex Von Rochow 1951 |
| | | Artemisietum annuæ Fijalcowski 1967 | 30 |
| | | Artemisietum annuæ Fijalcowski 1967 ambrosiotsam Siniscalco & Montacchini 1989 | 118, 119 |
| | | Conyzo-Lactucetum serriolae Lohmeyer in Oberdorfer 1957 | 3, 31, 104 |
| | | Datura stramonium and Malva neglecta community | 67, 91 |
| | | Erigeron canadensis community | 70, 86 |

| 39b.3.2 | Hordeion leporini | Br.-Bl. in Br.-Bl., Gajewski, Wraber & Walas 1936 corr. O. Bolós 1962 |
| | | Bassia scoparia and Chenopodium ambrosioides community (** | 91 |

| 39b.4 | URTICO-SCROPHULARIETALIA PEREGRINAE | Brullo ex Biondi, Blasi, Casavecchia & Gasparri in Biondi, Allegrezza, Casavecchia, Galdenzi, Gasparri, Pesaressi, Vagge & Blasi 2014 |
| | | Oxalis pes-caprae community | 70 |

| 39b.4.1 | Veronica-Urticion urensis | Brullo in Brullo & Marcenò 1985 |
| | | Bromo-Brassicetum sylvestris Brullo & Marcenò 1985 | 34 |

40 | GALIO APARINES-URTICETEA DIOICAEx Passarge ex Kopecký 1969 |
| 40.1 | GALIO APARINES-ALLIARIETALIA PETIOLATAE | Oberdorfer ex Görs & Müller 1969 |
| 40.1.1 | Petasition officinalis | Sill. 1933 em. Kopecký 1969 |
| | | Robinia pseudoacacia community | 39 |
| 40.1.2 | Geo-Alliarion | Lohmeyer & Oberdorfer ex Görs & Müller 1969 |
| | | Solidago canadensis community | 5, 89 |

| 40.1.5 | Allion triquetri | O. Bolós 1967 |
| | | Acantho-Smyrnietum olusatri Brullo & Marcenò 1985 | 34, 70 |
| | | Acanthus mollis community | 70, 117 |
| Class          | Order          | Alliance                | Association/Phytocoenon                                                                 | Reference number in the specific bibliographical list of Supplement 1 |
|---------------|---------------|-------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| FILIPENDULO   |              |                         | **41 FILIPENDULO ULMARIAE-CONVOLVULETAE SEPIUM** Géhu & Géhu-Franck 1987               |                                                                     |
|               | Order         | Alliance                | **41.1 CALYSTEGITALIA SEPIUM** Tüxen ex Mucina 1993 nom. mut. propos. Rivas-Martínez, T.E. Diaz, Fernandez-Gonzales, Izco, Loidi, Lousã & Penas 2002 |                                                                     |
|               | Order         | Alliance                | *Reynoutria japonica* community                                                       | 31                                                                  |
|               | Order         | Alliance                | *Helianthus tuberosus* community                                                       | 31                                                                  |
|               | Order         | Alliance                | *Solidago canadensis* and *E* riger *on annuus* community                              | 31                                                                  |
|               | Order         | Alliance                | *E* riger *on annuus* community                                                       | 31                                                                  |
|               | Order         | Alliance                | **41.1.1 Calystegion sepium** Tüxen ex Oberdorfer 1957 nom. mut. propos. Rivas-Martínez, T.E. Diaz, Fernandez-Gonzales, Izco, Loidi, Lousã & Penas 2002 |                                                                     |
|               | Order         | Alliance                | *Amorpha fruticosa* community                                                         | 81                                                                  |
|               | Order         | Alliance                | *Artemisia verlotiorum* community                                                     | 127                                                                 |
|               | Order         | Alliance                | *Arundini-Convolvuletum sepium* (Tüxen & Oberdorfer) O. Bolós 1962                     | 72                                                                  |
|               | Order         | Alliance                | *Arundini-Convolvuletum sepium* (Tüxen & Oberdorfer 1958) O. Bolós 1962                 | 11, 15, 34, 40, 46, 80, 99, 101                                     |
|               | Order         | Alliance                | *Arundo donax* community                                                               | 43                                                                  |
|               | Order         | Alliance                | *Calystegio sylvaticae-Arundinetum donacis* Brullo, Scelsi & Spampinato 2001           | 35, 38, 73, 84, 85, 87                                              |
|               | Order         | Alliance                | *Calystegio-Asteretum lanceolati* (Holzner et al. 1978) Passarge 1993                  | 63                                                                  |
|               | Order         | Alliance                | *Helianthus tuberosus* community                                                       | 15, 63, 71, 127                                                    |
|               | Order         | Alliance                | *Humulus scandens* community                                                           | 39                                                                  |
|               | Order         | Alliance                | *Rubus caesius* and *Amorpha fruticosa* community                                       | 89                                                                  |
|               | Order         | Alliance                | *Solidago canadensis* community                                                        | 81, 83                                                              |
|               | Order         | Alliance                | *Solidago gigantea* community                                                          | 39, 63, 127                                                        |
|               | Order         | Alliance                | **50 TUBERARIE TAA GUTTATAE** (Br.-Bl. in Br.-Bl., Roussine & Nègre 1952) Rivas Goday & Rivas-Martínez 1963 nom. mut. propos. Rivas-Martínez, T.E. Diaz, Fernández-González, Izco, Loidi, Lousã & Penas 2002 |                                                                     |
|               | Order         | Alliance                | **50.2 MALCOLMIETALIA** Rivas Goday 1958                                              |                                                                     |
|               | Order         | Alliance                | **50.3.2 Laguro ovati-Vulpion fasciculatae** Géhu & Biondi 1994                         |                                                                     |
|               | Order         | Alliance                | *Ambrosio coronopifolii-Lophochloetum pubescensii* Biondi, Brugiapaglia, Aliegretteza & Ballelli 1992 | 95, 99, 102                                                        |
|               | Order         | Alliance                | *Sileno coloratae-Vulpietum membranaceae* (Pignatti 1953) Géhu & Scoppola 1984          | 97                                                                  |
|               | Order         | Alliance                | **55 LYGEO SPARTI-STIPETEA TENACISSIMAE** Rivas-Martínez 1978 nom. conserv. propos. Rivas-Martínez, T.E. Diaz, Fernández-González, Izco, Loidi, Lousã & Penas 2002 |                                                                     |
|               | Order         | Alliance                | **55.2 HYPARRHENIETALIA HIRTAE** Rivas-Martínez 1978                                   |                                                                     |
|               | Order         | Alliance                | **55.2.1 Hyparrhenion hirtae** Br.-Bl., P. Silva & Rozeira 1956                          |                                                                     |
|               | Order         | Alliance                | *Pennisetum setacei-Hyparrhenietum hirtae* Gianguzzi, Ilardi & Raimondo 1996            | 36, 52                                                              |
|               | Order         | Alliance                | **56 MOLINIO-ARRHENATHERETEA** Tüxen 1937                                              |                                                                     |
|               | Order         | Alliance                | **56.4 HOLOSCHOENETALIA VULGARIS** Br.-Bl. ex Tchou 1948                               |                                                                     |
|               | Order         | Alliance                | **56.4.4 Paspalo distichi-Agrostion semiverticillatae** Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 |                                                                     |
|               | Order         | Alliance                | *Aster squamatus* and *Inula viscosa* community                                         | 94                                                                  |
|               | Order         | Alliance                | *Loto tenuis-Paspalenum paspaloidis* Biondi, Casavecchia & Radetic 2002                 | 25, 68                                                              |
|               | Order         | Alliance                | *Paspalo distichi-Polyposonetum viridis* Br.-Bl. in Br.-Bl., Gajewski, Wraber & Walas 1936 nom. mut. propos. Rivas-Martínez et al. 2002 | 15, 41, 46, 60, 61, 63, 68, 70, 76, 93, 94, 95, 99, 101             |
|               | Order         | Alliance                | (= *Paspalo distichi-Agrostidetum verticillati* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952) | 115                                                                 |
| Class | Order | Alliance | Association/Phytocoenon | Reference number in the specific bibliographical list of Supplement 1 |
|-------|-------|----------|-------------------------|---------------------------------------------------------------|
|       |       |          | *Paspalo distichi*-Polypogonetum viridis* Br.-Bl. in Br.-Bl., Gajewski, Wraber & Walas 1936 nom. mut. propos. Rivas-Martínez et al. 2002 facies with *Cyperus eragrostis* | 63 |
|       |       |          | *Paspalum distichum (= paspaloides)* community | 19, 81, 103 |
| 56.5  | PLANTAGINETALIA MAJORIS Tüxen ex Von Rochow 1951 |  | | |
| 56.5.1 | Lolio perennis-Plantaginion majoris Sissingh 1969 | | | |
|       | *Juncetum macri* (Diemont et al. 1940) Tüxen 1950 | | | |
|       | *Eleusine indica* community | | | 91 |
| 61    | CISTO CRETCI-MICROMERIETEA JULIANAE Oberdorfer ex Horvatić 1958 |  | | |
| 61.1  | *CISTO CRETCI-ERICETALIA MANIPULIFLORA* Horvatić 1958 |  | | |
| 61.1.1 | *Cisto cretici-Ericion manipuliflorae* Horvatić 1958 |  | | |
|       | *Opuntia ficus-indica* community | | | 69, 85 |
| 64    | RHAMNO CATHARTICAE-PRUNETEA SPINOSAE Rivas Goday & Borja ex Tüxen 1962 |  | | |
| 64.1  | *PRUNETALIA SPINOSAE* Tüxen 1952 |  | | |
|       | *Robinia pseudoacacia* and *Rubus ulmifolius* community | | | 6 |
|       | *Robinia pseudoacacia* and *Sambucus nigra* community | | | 70 |
| 64.1.1 | *Berberidion vulgaris* Br.-Bl. 1950 |  | | |
|       | "*Corno sanguineae-Ligustretum vulgaris*" sensu Biondi et al. 1999 non Horvat 1956 *amorphetosum fruticosae* Biondi, Vagge, Baldoni & Taffetani 1999 | | | 27 |
| 64.1.2 | *Cytision sessilifolii* Biondi in Biondi, Allegrezza & Guitian 1988 |  | | |
|       | *Cercido siliquastri-Rhoetum coriariae* Biondi, Allegrezza & Guitian 1988 | | | 22 |
| 64.3.1 | *Pruno-Rubion ulmifolii* O. Bolòs 1954 |  | | |
|       | *Clematido vitalbae-Arundinetum donacis* Biondi & Allegrezza 2004 | | | 18 |
| 65    | ALNETEA GLUTINOSAE Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946 |  | | |
| 65.1  | *SALICETALIA AURITAE* Doing ex Westhoff in Westhoff & Den Held 1969 |  | | |
| 65.1.1 | *Salicion cinereae* Müller & Görs 1958 |  | | |
|       | *Salicetum cinereae* Zolyomi 1931 *Amorpha fruticosa* variant | | | 65 |
| 68    | SALICI PURPUREAE-POPULETEA NIGRAE Rivas-Martínez & Cantó ex Rivas-Martínez, Báscones, T.E. Diaz, Fernández-González & Loidi 2001 |  | | |
| 68.1  | *POPULETALIA ALBAE* Br.-Bl. ex Tchou 1948 |  | | |
|       | *Robinia pseudoacacia* community | | | 122 |
| 68.1.1 | *Populion albae* Br.-Bl. ex Tchou 1948 |  | | |
|       | *Acer negundo* community | | | 46 |
|       | *Ailanthus altissima* and *Robinia pseudoacacia* community | | | 6 |
| 69    | SALICETEA PURPUREAE Moor 1958 |  | | |
| 69.1  | *SALICETALIA PURPUREAE* Moor 1958 |  | | |
| 69.1.1 | *Salicion albae* Soó 1930 |  | | |
|       | *Amorpha fruticosae-Salicetum albae* Poldini, Vidali, Bracco, Assini & Villani in Poldini, Vidali & Ganis 2011 | | | 13, 27, 48, 71, 107 |
|       | *Sicyos angulatus* community | | | 40, 112 |
| 69.1.2 | *Salicion triandrae* Müller & Görs 1958 |  | | |
|       | *Salicetum triandrae* (Malcut 1929) Noirfalise 1955 *Amorpha fruticosa* variant | | | 27 |
| Class | Order | Alliance | Association/Phytocoenon | Reference number in the specific bibliographical list of Supplement 1 |
|-------|-------|----------|-------------------------|---------------------------------------------------------------|
| 69.1.4 | | | Salicion incanae | 69.1.4 Salicion incanae Aichinger 1933 Salicetum incano-purpureae Sillinger 1933 Amorpha fruticosa variant 27, 62 |
| 70 | QUERCETEA ILICIS Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 | | | 70.1 QUERCETALIA ILICIS Br.-Bl. ex Molinier 1934 70.2.2 Oleo sylvestris-Ceratonion siliquae Br.-Bl. ex Guinochet & Drouineau 1944 Asparago acutifolii-Oleetum sylvestris Bacchetta et al. 2003 Opuntia ficus-indica variant 117 |
| 71 | QUERCO ROBORIS-FAGETEA SYLVATICAE Br.-Bl. & Vlieger in Vlieger 1937 | | | 71.1 FAGETALIA SYLVATICAE Pawłowski in Pawłowski, Sokolowski & Wallisch 1928 71.1.4 Tilio platyphylli-Acerion pseudoplatani Klika 1955 Robinia pseudoacacia community 50 71.1.6 Carpinion betuli Issler 1931 Prunus serotina community 113 71.1.10 Alnion incanae Pawłowski in Pawłowski, Sokolowski & Wallisch 1928 Amorpha fruticosa community 40 Populus nigra and Robinia pseudoacacia community 26 Robinia pseudoacacia and Rubus ulmifolius community 55 71.2 QUERCETALIA ROBORIS Tüxen 1931 Buddleja davidii community 74 71.2.1 Quercion roboris Malcuit 1929 Robinia pseudoacacia community 50 71.3 QUERCETALIA PUBESCENTI-PETRAEAE Klika 1933 71.3.3 Crataego laevigatae-Quercion cerridis Arrigoni 1997 Sambuco nigrae-Robinietum pseudacaciae Arrigoni 1997 10 |
| 75 | ROBINIETEA Jurko ex Hadac & Sofron 1980 | | | 75.1 CHELIDONIO-ROBINIETALIA Jurko ex Hadac & Sofron 1980 |
### Class Order Alliance Association/Phytocoenon Reference number in the specific bibliographical list of Supplement 1

75.1.1 **Ballotina nigrae-Robinion** Jurko ex Hadac & Sofron 1980  
*Ailanthus altissima* community  
88

75.1.2 **Bryonio-Robinion** Ubaldi, Melloni & Cappelletti in Ubaldi 2003  
*Ailanthus altissima* community  
46  
*Bryonio-Robinietum* Ubaldi, Melloni & Cappelletti in Ubaldi 2003  
124  
*Robinia pseudoacacia* community  
46, 98, 128, 130

75.1.3 **Lauro nobilis-Robinion pseudoacaciae** Allegrezza, Montecchiari, Ottaviani, Pelliccia & Tesei 2019  
*Melisso altissimae-Robinietum pseudoacaciae* Allegrezza, Montecchiari, Ottaviani, Pelliccia & Tesei 2019  
2  
*Rubio peregrinae-Robinietum pseudoacaciae* Allegrezza, Montecchiari, Ottaviani, Pelliccia & Tesei 2019  
2

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**BRYOPHYTE COMMUNITIES**

CERATODONTO PURPUREI-POLYTRICHETEA PILIFERI Mohan 1978  
**POLYTRICHETALIA PILIFERI** von Hübschmann 1975  
**Campylopodion polytrichoidis** Giacomini 1951  
*Campylopus introflexus* community  
108, 111

(*) In Poldini et al. (1998) the associations *Panico-Polygonetum persicariae* Pignatti 1953 and *Oxalido-Chenopodietum polyspermi* (Br.-Bl. 1921) Sissingh (1942) 1946 are considered syntaxonomic synonyms of *Echinochloo-Setarietum pumilae* Felföldy 1942 corr. Mucina 1993. The authors reached this result by elaborating the synthetic tables of only a part of the works published at national level with the name *Panico-Polygonetum* and *Oxalido-Chenopodietum*. Beside this, in Poldini et al. (1988) the numbers of tables and relevés taken into account for the analysis were not indicated. These authors did not also consider any subassociations and variants described. For these reasons, we prefer to report the names of the associations as they were indicated in the original works, without including them as synonyms in the name *Echinochloo-Setarietum*.

(**) This association was described for the north-Adriatic Italian coasts, published by Pignatti (1952-53) as "nom. prov.", therefore not validly, according to ICPN (Art. 3b, Weber et al., 2000). It cannot be attributed to *Atriplicion littoralis* sensu Nordhagen 1940, as already highlighted by Mucina et al. (2016, p. 137), according to whom it must be referred to ruderal communities of *Atriplicion Passarge 1978* (*Sisymbrietalia*). After examining the original table in Pignatti (1952-53), we agree with the comments of Mucina et al. (2016). Anyway, in the Italian Vegetation Prodrome, the alliance *Atriplicion Passarge 1978* is not reported, so we provisionally prefer to attribute this association to *Hordeion leporini*, the most similar alliance from the eco-coenological point of view present in the Italian Vegetation Prodrome.

Soon after the development and data analysis of this article, Pellizzari (2020) hypothesized a reinterpretation of *Cyperus glomeratus*, currently considered alien species in Italy, as a probable native. We are currently sticking to the consolidated position of Galasso et al. (2018), pending a reassessment of the chorology of this species.

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