Diagnosis and syntaxonomic interpretation of Annex I Habitats (Dir. 92/43/EEC) in Italy at the alliance level

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Abstract
Starting from the recently produced Italian Habitats interpretation Manual (http://vnr.unipg.it/habitat), a thorough diagnosis of the Annex I Habitats recorded in the Italian territory is reported, selecting the alliance level as the most suitable standard phytosociological rank for a detailed nationwide overview. In order to solve a number of well-known problems, arising from the definitions reported in the European EUR/27 Manual, each Habitat has been assigned a short, exhaustive although concise diagnostic sentences which contains its most significant ecologic features, with specific reference to the peculiarities of the Italian territory. Biogeographic, synecological (mainly bioclimatic, morphological, geologic/edaphic), structural and floristic characteristics of each Habitat are pointed out. When the rarity or vulnerability status has been considered worthy of priority at the national scale, it has been indicated.

The 131 Habitats listed for Italy, which represent only partially the Italian biodiversity, have been referred to 268 alliances. A complete syntaxonomic framework is reported in order to offer a robust although still improvable phytosociological ground. The paper aims at standing as a reference document for Natura 2000 knowledge and management in Italy; it also represents a large-scale, expert-revised tool to allow supra-national comparisons and support future implementation of the Annex I.

Key words: biodiversity, biogeography, Habitat Directive, Natura 2000, phytosociology, syntaxonomy, vegetation.

Introduction
Since the approval of the 92/43/EEC Directive, known as “Habitat Directive”, phytosociology rose to a new flourishing phase. Included for the first time in an official prescriptive document, its syntaxonomic categories have been acknowledged as suitable synthetic ecological descriptors. The Habitat Directive relied in fact on phytosociology for the identification of habitats deserving the highest efforts of conservation, included in the Annex I and described in the European interpretation Manual (latest version EUR/27, European Commission, 2007).

With its floristic, biogeographical, ecological, statistic and syndynamic grounds, the phytosociological classification stands as the most complete model to systematize such a complex type of living systems as the vegetation ecosystems. This has been recently reaffirmed on the occasion of the celebration of one century from the first accurate definition of plant association (Biondi, 2011; Blasi & Frondoni, 2011; Géhu, 2011; Pott, 2011), while more and more vegetation scientists have been contributing to the debate about the strict interconnections between phytosociological syntaxa and Annex I Habitats, offering important tools for management and conservation (Seliskar, 1998; Loidi, 1999; Dimopoulos et al., 2006; Costa et al., 2007; Rodwell et al., 2007; Biondi, 2007b).

Besides this merit, the 92/43/EEC Directive introduced a number of open issues, as well underlined by Evans (2006, 2010, 2012) and Paavola (2004). With regard to the Italian context, these issues can be mainly imputed to 1) a scarce homogeneity in the used syntaxonomical ranks, 2) the reference to an (often) out of date classification system, 3) the mostly Central-North-European focus.

The general need to solve those problems became more and more urgent as soon as the European rule on habitats conservation became binding at the national, regional and local level. The wide-mesh net of the Annex I list of Habitats needed to be enforced and made denser by introducing in it the territorial knowledge, with its luggage of floristic, biogeographical and...
ecological peculiarities. This push led to the drawing up of an Italian interpretation Manual, which involved a number of Italian vegetation scientists, coordinated by the Italian Botanical Society. The Manual was developed through a long, cross-referenced, critical and revised analysis of the Italian vegetational heritage at risk of deterioration or disappearance (Biondi et al., 2009; Blasi et al., 2010). This useful product, constantly updated as the Regional Administrations progressively adopt the latest improvement suggested by the botanical experts, is currently available online (http://vnr.unipg.it/habitat/).

Two decades after the European Directive promulgation, it’s time for Italy to strike a balance. The main aim of the present paper is to offer, starting from the above-mentioned Italian Manual, an expert-reviewed homogeneous, standardized, thorough diagnosis of the Annex I Habitats recorded in the Italian territory, with a nationwide validity and applicability. The paper also aims at offering the international audience an updated synthetic outline of the Italian Habitats’ interpretation and actual occurrence. This will allow, in future, supranational comparisons and syntaxonomical analyses, emphasizing on the vegetational peculiarities of the national territories. Furthermore, it represents a possible tool to improve and implement the Annex I itself, thanks to the advances in territorial knowledge.

**Materials and methods**

The results of the large, many-voiced analytic process that led to the Italian Habitats interpretation Manual are here reported in a standardized way. Each of the 131 Habitats recorded in Italy is assigned a diagnosis, whose structure is composed by three parts: name/code, diagnostic sentence, syntaxonomic reference.

The Habitat’s name, fixed by the 43/92/EEC Directive, is reported unchanged for reasons of opportunity, since it, together with the code, represents an identifiable string at the European level.

The diagnostic sentence is a condensed Habitat description, formed by at most 40 words. It contains a biogeographic, synecological (mainly bioclimatic, morphological, geologic/edaphic), structural and floristic characterization, however some of these features may be missing when they are not crucial for the identification, or vary in very wide range, or cannot be univocally defined. The 40-words format was chosen in order to create a nimble, easy and fast nevertheless complete descriptive tool; of course it imposed a severe synthesis and forced the description of complex environmental conditions into a narrow case, but on the other side it allowed a homogeneous adjustment of the diagnoses to a standard. Further informations and details are constantly available in the online version of the Italian Manual (http://vnr.unipg.it/habitat/).

These short diagnoses aim at solving some well-known problems concerning Habitat uncertain attribution, overlapping and misinterpretation, often resulting from the European Habitat interpretation manual (European Commission, 2007). The here reported descriptions result from the wide scientific phytosociological production regarding the Italian territory in the last 2 decades, whose complete and updated references are available in the online version. In many cases, these descriptions derive from scientific texts specifically dealing with one or few Habitat-related topics, based on specialististic analyses, discussions or revisions (e.g. Assini, 2007; Bagella et al., 2007; Biondi, 2007a; Biondi et al., 1997, 2001, 2003, 2005, 2009, 2010; Blasi et al., 2004; Brullo et al., 1986, 1998, 2001; Brullo & Guarino, 2002; Brullo & Minissale, 1998; Brullo & Spampinato, 2003; Gigante et al., 2007; Poldini et al., 2010; Spampinato et al., 2008; Terzi, 2011; Vagge & Biondi, 2008). The Regional Manuals and other contributions produced at Regional level represent also a useful source of informations, regarding for instance Friuli-Venezia Giulia (Poldini et al., 2006), Trentino-Alto Adige (Ruffini et al., 2001; Agostini, 2003; Caldonazzi et al., 2008), Liguria (Mariotti et al., 2003; Mariotti, 2008), Emilia-Romagna (Alessandrini & Tosetti, 2001; Tinarelli, 2005; Bassi, al et al., 2000, 2001, 2005). The bioclimatic characterization is in accordance with terms, indexes and definitions reported in Rivas-Martínez et al. (1999, 2002); the abbreviation b.b. is used for bioclimatic belt(s). Only in extremely peculiar cases a remark about rarity or conservation risk is added. Plant names, when present, are always followed by the corresponding Author’s name, according to the most recent taxonomic revisions (Conti et al., 2005, 2007; www.anarchive.it). The typical species of each habitat are not reported, unless it’s needed for the diagnosis; more details about this and other aspects can be found in the online version.

The syntaxonomic reference (Sr) reports for each Habitat one of more of the 268 identified alliances, thus offering a clear, unequivocal phytosociological framework for each Italian Habitat. As indicated in the Introduction, one of the weak points of the
Annex I Habitats definitions (European Commission, 2007) is a wide heterogeneity in the syntaxonomical indications: some of them are extremely definite and reach the association level, some other are more general (alliance, order or class level), some only mention specific or generic plant names. In this paper, the alliance level has been selected as the most suitable for a Habitat overview at the national scale, since it carries a large amount of precise floristic and biogeographical informations, keeps a robust link to the upper ranks with their ecological, physiognomical, structural features, nevertheless it leaves a wide range of potentially different expressions at the local level. The alliance level has been used several times to indicate the ecological context for threatened species and habitats (Papastergiadou et al., 1997; Rodwell et al., 2002; Stanova, 2003). In this sense, it’s a good compromise between an endless list of associations and a generic indication of orders or classes. In the text, the alliances are listed according to their sequence in the syntaxonomic frame.

When needed, a short note is added to provide explanatory details or correspondences to other habitat classification systems. The following abbreviations are used to mention the related codes: H is for Habitat; CB is for Corine Biotopes (Devillers et al., 1991); E is for Eunis (Davis et al., 2004).

As emphasized by Blasi et al. (2010), the Italian Habitats Manual drew attention to the fact that sometimes the “priority” status should be gauged on the ground of its actual territorial rarity or risk. The most prominent cases of Habitats which, according to their Italian distribution and status, should be assimilated to priority ones are here indicated.

For each Habitat, number of Natura 2000 Sites where it has been recorded and total surface (ha) inside the Sites are indicated in brackets. These data derive from Natura 2000 data bank of the Italian Ministry (http://www.minambiente.it). In order to clarify controversial aspects and to avoid misinterpretations, in the list, we included also those Habitats which had erroneously been recorded for the Italian territory in the past, but should definitely be excluded on the ground of the present interpretation and knowledge.

Finally, a complete syntaxonomic scheme is reported in Appendix I, including also the names of the Authors of each syntaxon which are here omitted. Only in few cases (mainly, but not only, occurring with forest habitats), due to a very narrowly-defined biogeographical range, the suballiance is indicated in the syntaxonomic frame. The syntaxa names comply with the ICPN (Weber et al., 2000). The syntaxonomic nomenclature and framework are mostly the fruit of a large compromise, considering that many problematic syntaxa are still under revision and there is a scarce agreement, among different authors, about some of them. Most of the cases the authors, by mutual consent, assented to comply with Rivas-Martínez et al. (2001, 2002), waiting for a definite solution of the most ticklish syntaxonomic issues. In particular, as concerns the class Festuco-Brometea erecti Br.-Bl. & Tüxen ex Klika & Hadač 1944, recently subjected to revisions and new interpretative proposals (Mucina et al., 2009; Di Pietro, 2011; Biondi & Galdenzi, 2012), the authors here refer to Biondi et al. (2005), waiting for a more exhaustive arrangement of this complex phytosociological class.

The Italian Habitats

1 - Coastal and halophytic habitats

1110 - Sandbanks which are slightly covered by sea water all the time (63 Sites - 13,326 ha)

Permanently submerged infralittoral sandbanks (depth generally < 20 m), giving rise to very heterogeneous habitats, in relation to sediment grain size and presence/absence of vegetation. Sr: Zostericion marinae, Lithophyllion stictaeformis, Caulerpion.

Note: when the sandbanks regularly emerge with low tide, see H1140.

1120* - Posidonia beds (Posidonion oceanicae) (166 Sites - 172,023 ha)

Submerged grasslands characteristic of the Mediterranean infralittoral belt (depth generally between 30 and 40 m), dominated by Posidonia oceanica (L.) Delile, colonizing hard or mobile substrates, with water salinity between 36 and 39‰. Sr: Zostericion marinae, Peyssonnelion squamariae, Cystoseirion crinitae, Caulerpion.

1130 - Estuaries (25 Sites - 1,555 ha)

Final stretch of rivers influenced by tidal action, with a wide salinity gradient (from fresh to purely salt water), frequent presence of fine sediments and extensive intertidal sandy/muddy bars, with or without vegetation from purely marine to brackish or halophytic. Sr: Ruppion maritimae, Zosterion marinae, Salicornion
1140 - Mudflats and sandflats not covered by seawater at low tide (8 Sites - 10,107 ha)
Coastal sands and muds of oceans, seas and lagoons, emerging during low tide, generally lacking in vascular vegetation, coated by blue algae and diatoms; when the emerging period is very restricted, Zostera marina L. dominated communities may be present.
Sr: Zosterion marinae.

1150* - Coastal lagoons (91 Sites - 76,907 ha)
Coastal aquatic environments with shallow, lentic, salt/brackish waters, with considerable seasonal variations in salinity and depth in relation to water supply, rainfall and temperature, usually separated by sandy/pebbly bars, less frequently by low rocky coasts, with or without vegetation.
Sr: Charion fragilis, Charion canescens, Potamion, Zannichellion pedicellatae, Zannichellion obtusifoliae, Ruppion maritimae, Rielion helicophyllae, Zostерion marinae, Cystoseirion crinitae, Ulvion laetevirentis.

1160 - Large shallow inlets and bays (11 Sites - 3,010 ha)
Large coastal coves and shallow bays, sheltered from waves, characterized by a complex mosaic of photophilous, interdependent, benthic communities with high biodiversity, belonging to the mediolittoral (intertidal) and sublittoral (subtidal) belts; the influence of fresh water is limited or absent.
Sr: Zosterion marinae, Cystoseirion crinitae.

1170 - Reefs (117 Sites - 28,396 ha)
Cliffs of either biogenic or geogenic origin, made out of hard/compact substrata, emerging from the seabed in the sublittoral and coastal belts, hosting a zonation of benthic communities of algae, animal species and coralogenous concretions.
Sr: Lithophyllion stictaeformis, Peyssonnelion squamariae, Schottorion nicaeensis, Cystoseirion crinitae, Sargassion hornschuchii, Ulvion laetevirentis, Entophyssalidion deustae, Bangion fuscopurpureae, Ralfsion verrucosae.

12 - Sea cliffs and shingle or stony beaches
1210 - Annual vegetation of drift lines (182 Sites - 7,726 ha)
Therophytic halo-nitrophilous vegetation colonizing the sandy/pebbly beaches, between the aphytotic area and the psammophilous perennials coenoses, on substrata rich in sea salts and organic matter accumulated by the waves.
Sr: Euphorbion peplis, Thero-Atriplicion.

1240 - Vegetated sea cliffs of the Mediterranean coasts with endemic Limonium spp. (156 Sites - 11,475 ha)
Mediterranean cliffs and rocky shores colonized by chasmophytic/comophytic, halophilous and rupicolous, highly specialized vegetation, living in the crevices of rocks, withstanding direct contact with marine aerosols, characterized by many local endemisms of the genus Limonium Mill.
Note: N-Sardinia Euphorbia pithyusa L. communities should be referred to H5320.

13 - Atlantic and Continental salt marshes and salt meadows
1310 - Salicornia and other annuals colonizing mud and sand (85 Sites - 7,926 ha)
Pioneer halophilous annual vegetation (mainly Salicornia L., sp. pl.) developed in salt marshes, colonizing large mudflats or clearings in salt-tolerant perennial vegetation, or along the edge of halophilous communities dominated by Suaeda Forskål, Kochia Roth, Atriplex L., Salsola L. species.
Sr: Frankenion pulverulentae, Saginion maritimae, Crypsidion aculeatae, Salicornion patulae, Microcnemion coralloidis, Thero-Suaedion.

1320 - Spartina swards (Spartinion maritimae) (9 Sites - 2,129 ha)
Perennial halophytic vegetation, mainly composed by pioneer herbaceous species belonging to the genus Spartina Schreber, [e.g. Spartina maritima (Curtis) Fernald], typically colonizing muddy brackish coastal environments (“velme”), on soaked soils rich in organic matter, represented in Italy by endemic communities.
Sr: Spartinion maritimae.

1340* - Inland salt meadows (2 Sites - 4 ha)
Non-coastal salty environments hosting halophilous vegetation; in Italy a typical example is represented by the phytoocoenoses dominated by Puccinellia fasciculata (Torr.) E.P. Bicknell subsp. fasciculata [=Puccinellia borreri (Bab.) Hitchc.], at present only known in Emilia-Romagna.
Sr: Puccinellion distantis.

14 - Mediterranean and thermo-Atlantic saltmarshes and salt meadows
1410 - Mediterranean salt meadows (Junctetalia maritimi) (122 Sites - 12,156 ha)
Mediterranean, coastal and subcoastal, hygrohalophilous and sub-halophilous grasslands dominated by species of the genus Juncus L. (including J. fruticosae, Arthrocenon macrostachyi, Spartinion maritimae.
subulatus, CB15.58), colonizing the back dune wet ecosystems on sandy substrates inundated by brackish water for medium-long periods.
Sr. Juncion maritimi, Plantaginio crassifoliae, Elytrigio athericae-Artemission coerulecentis.

1420 - Mediterranean and thermo-Atlantic halophilous scrubbs (Sarcocornietea fruticosi) (86 Sites - 13,960 ha)
Perennial, halophilous, species-poor, succulent chamaephytic/nanophanerophytic vegetation, mainly formed by species of the genera Sarcocornia A.J. Scott and Arthrocnemum Moq., with a Mediterranean-Atlantic distribution, colonizing flooded, from hypersaline to mesosaline, clay-rich soils, occasionally standing long periods of desiccation.
Sr. Salicortion fruticosae, Arthrocnemion macrostachyi, Suaedion verae, Limoniastrion monopetalai, Triglochinio barrelleri-Limonion glomerati.

1430 - Halo-nitrophilous scrubbs (Pegano-Salsoletea) (34 Sites - 1,305 ha)
Perennial, halo-nitrophilous, chamaephytic/nanophanerophytic, often succulent, shrubby vegetation developing on salty arid soils, usually in dry or semi-arid Thermo-Mediterranean bioclimate, colonizing both coastal (e.g. cliffs, back dunes) and inland (e.g. argillaceous badlands) environments.
Sr. Suaedion verae, Limoniastrion monopetalai, Salsolo vermiculatae-Peganion harmalae, Artemision arborescentis.

15 - Salt and Gypsum Inland steppes
1510* - Mediterranean salt steppes (Limoniaretalia) (75 Sites - 19,749 ha)
Perennial, halophilous grasslands dominated by Limonium Mill. species, developing in coastal environments or in inland areas (salty endorheic basins), on clayey/sandy-clayey soils, temporarily soaked (exceptionally flooded) by salt waters, subject to summer desiccation, in the Thermo- and Meso-Mediterranean b.b.
Sr. Limoniastrion monopetalai, Triglochinio barrelleri-Limonion glomerati, Inulion crithmoidis.
Note: when regularly flooded, with other macrobioclimates than Mediterranean, see H1420.

2 – Coastal sand dunes and inland dunes
Sand dune Habitats include recent coastal sand dune systems characterised by strictly psammophilous vegetation, the only exception being 2330 (Inland dunes with open Corynephorus and Agrostis grasslands), including ancient, noncoastal sand dunes, only found in Lombardy and Piedmont. This type is divided in 3 subgroups, all of which are represented in Italy: Sea dunes of the Atlantic, North Sea and Baltic coasts (21); Sea dunes of the Mediterranean coast (22); Inland dunes, old and decalcified (23). It contains a total of 21 Habitats of community interest, 11 of which are found in Italy (3 have priority status).

21 - Sea dunes of the Atlantic, North Sea and Baltic coasts
Note on the habitat type 21: differently from the N-W European coasts, in Italy the dune systems are heavily damaged and fragmented by human settlements and facilities, thus all the corresponding Habitats (when present) should be given the priority level.

2110 - Embryonic shifting dunes (108 Sites - 4,128 ha)
Psammophilous, perennial, hemicyryptophytic/geophytic vegetation, colonizing embryonic dunes on low sandy coasts, often contributing to their stabilization by an effective rhizomatic system; a prominent role is often performed by Agropyron junceum (L.) Beauv. subsp. mediterraneum Simonet et Guinochet (= Elymus farctus (Viv.) Runemark ex Melderis subsp. farctus).
Sr. Ammophilion australis.

2120 - Shifting dunes along the shoreline with Ammophila arenaria (white dunes) (113 Sites - 4,632 ha)
Psammophilous, perennial, hemicyryptophytic/geophytic vegetation, colonizing the inner, higher coastal dunes (defined as “shifting” or “white” dunes), dominated by Ammophila arenaria (L.) Link subsp. arundinacea H. Lindb. [= subsp. australis (Mabille) M. Laínz].
Sr. Ammophilion australis.

2130* - Fixed coastal dunes with herbaceous vegetation (grey dunes) (23 Sites - 1,126 ha)
fully or partially stabilized sandy and sandy-pebbly coastal deposits, colonized on their inward slope (usually sheltered from salt winds and sea water) by both annual and perennial, cryptogamic-chamaephytic vegetation.
Sr. Crucianellion maritimae, Saturejion subspicatae, Koelerion arenariae.

2160 - Dunes with Hippophae rhamnoides (7 Sites - 336 ha)
Endemic, edapho-xerophilous, shrubby vegetation of the North-Adriatic dune systems, standing the salty sea-aerosol, on scarcely developed soils, in the Supra-Temperate b.b.
Sr. Pruno-Rubion ulmifolii.
Note: very rare in Italy and therefore to be assimilated with a priority Habitat; with Mediterranean...
macrobioclimatic, see H2250*.

2190 - Humid dune slacks (not present)
Due to misinterpretation, this Atlantic Habitat had been recorded in some Italian Regions (19 Sites - 909 ha); however its occurrence has to be excluded from Italy and the observed Habitats referred to H3120, H3130, H3140, H3150, H3170* and H6420.

22 - Sea dunes of the Mediterranean coast

2210 - Crucianellion maritimarum fixed beach dunes
(92 Sites - 3,175 ha)
Chamaephytic and suffrutiuous, short-sized primary vegetation colonizing the inward slope of stabilized and well-developed dune systems, on compact sand, mainly in the Mediterranean Bioclimate.
Sr: Crucianellion maritimarum.
Note: very localized and in regression in Italy due to the reduction of suitable sites, to be assimilated with a priority Habitat.

2230 - Malcolmietalia dune grasslands (106 Sites - 2,240 ha)
Mostly annual, weakly to strongly nitrophilous vegetation, with a late winter/early spring phenology, colonizing the clearings of perennial grass communities belonging to the class Anmophylletea, on sandy dunes, both in Mediterranean and Temperate Macrobioclimates.
Sr: Alkanno-Maresion nanae, Laguro ovati-Vulpion membranaceae, Maresion nanae.

2240 - Brachypodietalia dune grasslands with annuals (86 Sites - 5,399 ha)
Ephemeral annual vegetation, with a spring phenology, colonizing the clearings in the shrubby/woody or herbaceous perennial vegetation of stabilized dunes (including palearctic dunes), on sands resulting from the degradation of basic substrata.
Sr: Tuberarion guttatae, Trachynion distachyae, Thero-Brachypodion ramosi.

2250* - Coastal dunes with Juniperus spp. (104 Sites - 9,918 ha)
Heterogeneous habitat including several woody vegetation types dominated by species of the genus Juniperus L. with Mediterranean sclerophyllous shrubs, developed on stabilized coastal dunes along the sandy shores of the Mediterranean, mostly in Mediterranean (rarely Temperate) Macrobioclimate.
Sr: Pruno-Rubion ulmifolii, Berberidion, Juniperion turbinatae.

2260 - Cisto-Lavanduletalia dune sclerophyllous scrubs (33 Sites - 3,757 ha)
Inner stabilized part of the coastal sandy dune system, from Mediterranean to Temperate (Submediterranean) Macrobioclimate colonized by xero-thermophilous vegetation dominated by sclerophyllous shrubs and chamaephytes (e.g. maquis, garrigues).
Sr: Teucrion mari, Cistion ladaniferi, Cisto cretici-Ericion manipuliflorae, Helianthemeto italic-Aphyllanthion monspeliensis, Rosmarinion officinalis, Cisto eriocephali-Ericion multiflorae, Juniperion turbinatae.

2270* - Wooded dunes with Pinus pinea and/or Pinus pinaster (74 Sites - 18,519 ha)
Inner stabilized part of the coastal sandy dune system, from Mediterranean to Temperate (Submediterranean) Macrobioclimate, colonized (or sometimes forested) by Mediterranean thermophilous pine species (Pinus halepensis Mill., P. pinea L., P. pinaster Aiton).
Sr: Juniperion turbinatae, Oleo-Ceratonion siliqueae.
Note: pine forests on different types of substrata should be referred to H9540.

23 - Inland dunes, old and decalcified

2330 - Inland dunes with open Corynephorion and Agrostis grasslands (not officialized yet, however already included in the Italian Manual)
Dry lichen-rich acidophilous grasslands developed on sandy inland dunes and deposits with fluvi-glacial origin, in the Western Po Valley; being a disjointed distribution area, the Italian sites lack in some strictly Atlantic species.
Sr: Corynephorion canescens.

3 – Freshwater habitats

31 - Standing water

3110 - Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (2 Sites - 6 ha)
Perennial, aquatic or amphibious, small-sized vegetation, colonizing the shores of lakes and ponds with shallow, oligotrophic, slightly mineralized and base-poor water, on sandy plains, mainly in the Supra- and Oro-Temperate b.b.
Sr: Eleocharition acicularis, Isoëtion lacustris, Hyperico elodis-Sparganion.
Note: partially overlapped with H3130, the latter to be used when the annual component (Nanocyperetalia fusci) is also present.

3120 - Oligotrophic waters containing very few
minerals generally on sandy soils of the West Mediterranean, with Isoëtes spp. (9 Sites - 97 ha)
Perennial to annual, amphibious, dwarf-sized vegetation, colonizing oligotrophic, mineral-poor waters, mainly on sandy soils, with a Western Mediterranean distribution, in the Mesosub-, Meso- and Thermo-Mediterranean b.b.

3160 - Natural dystrophic lakes and ponds (32 Sites - 185 ha)
Natural dystrophic lakes and ponds with acidic water, often brown due to the presence of peat or humic acids, generally on peat substrata, colonized by submerged hydrophytic species-poor vegetation, mainly distributed in the Oro- and Supra-Temperate b.b.
Sr: Sphagno-Utricularion, Scorpidio-Utricularion.

3170* - Mediterranean temporary ponds (123 Sites - 5,766 ha)
Perennial to annual, amphibious, Mediterranean vegetation, mainly composed by dwarf-sized therophytes and geophytes, with a late winter/early spring phenology, developing in wet systems with shallow temporary ponds, in the Mesosub-, Meso- and Thermo-Mediterranean b.b.
Sr: Isoëtion, Preslion cervinae, Agrostion salmanticae, Cicendion, Cicendio-Solenopsion laurentiae.
Note: this Habitat includes also the CB22.32; for not-temporary ponds see H3120.

32 - Running water
3220 - Alpine rivers and the herbaceous vegetation along their banks (113 Sites - 8,893 ha)
Pioneer, herbaceous/suffruticous vegetation, with a prevalence of Alpine species, colonizing pebbly and sandy shores of rivers with “Alpine” regime; these environments are characterized by an alternation of flooding and drying periods.
Sr: Phalarion arundinaceae, Epilobion fleischeri.

3230 - Alpine rivers and their ligneous vegetation with Myricaria germanica (24 Sites - 931 ha)
Pioneer, discontinuous, short (1-2 m) shrubby vegetation dominated by Myricaria germanica (L.) Desv., with an extremely poor herbaceous layer, colonizing silt-rich gravel deposits along rivers with “Alpine” regime; very rare in Italy, mainly distributed in Central Europe.
Sr: Salicion incanae.
Note: to be assimilated with a priority Habitat.

3240 - Alpine rivers and their ligneous vegetation with Salix elegans (153 Sites - 9,291 ha)
Pioneer, woody, willow-dominated vegetation, colonizing the gravelly-sandy shores and bed of rivers with “torrential” regime, with an extremely poor herbaceous layer, standing notable changes in the level of the water table during the year.
Sr: Salicion incanae.
Note: in spite of the name, the distribution of this Habitat is not restricted to the Alps.

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(including braided rivers) facing intense dry periods in summer, in Submediterranean or Mediterranean climatic conditions.

Sr: Glaucion flavi, Xerobromion, Euphorbion rigidae, Artemisio albae-Saturejion montanae.
Note: this Habitat includes also CB32.4A1.

3260 - Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (185 Sites - 6,210 ha)
Perennial, herbaceous, species-poor, aquatic macrophytic phanerophytic/bryophytic vegetation, colonizing limpid water in well illuminated river stretches, composed by partially or totally submerged species, sometimes with emerging flowers.
Sr: Ranunculion fluitantis, Ranunculion aquatilis.
Note: with standing water, see H3150.

3270 - Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation (130 Sites - 5,577 ha)
Pioneer, herbaceous, nitrophilous, annual vegetation colonizing the naturally nitrate-rich, periodically flooded river banks, on different types of substrata (from clay, sand and silt to gravel), from plain to montane belts, with a late-summer/autumn phenology.
Sr: Bidention tripartitae, Chenopodion rubri.

3280 - Constantly flowing Mediterranean rivers with Paspalo-Agrostidion species and hanging curtains of Salix and Populus alba (110 Sites - 8,963 ha)
Perennial, hygro-nitrophilous, species-poor, dense grasslands, dominated by rhizomatic species, colonizing permanently wet and temporarily flooded soils with a medium to fine granulometry, rich in organic matter, along permanently flowing Mediterranean rivers.
Sr: Paspalo-Agrostion verticillati.
Note: with intermittently flowing water, see H3290.

3290 - Intermittently flowing Mediterranean rivers of the Paspalo-Agrostidion (53 Sites - 4,437 ha)
This Habitat differs from H3280 only in that it can be found along intermittently flowing Mediterranean rivers, with a dry bed for part of the year, sometimes originating pools hosting vegetation belonging to the class Potamogetea.
Sr: Paspalo-Agrostion verticillati.
Note: with permanently flowing water, see H3280.

4 – TEMPERATE HEATH AND SCRUB
This type, the only one not subdivided in subtypes, is represented in Italy only by 5 Habitats (1 with priority status). It is more common in the mountainous areas of alpine and peninsular regions, the only exception being H4030 (European dry heaths). Absent in Campania and Apulia, it includes some oro-Mediterranean communities commonly found in mountainous areas, both on the largest islands and along the coasts.

40 - TEMPERATE HEATH AND SCRUB
4030 - European dry heaths (128 Sites - 10,288 ha)
Short-sized, shrubby, acidophilic, Calluna vulgaris (L.) Hull heaths, often with Vaccinium L., Genista L., Erica L., Ulex L. species, in Central-W and N-W Italy from plain to montane belts, on sandy/silty, nutrient-poor soils, dry or with temporary water slack.
Sr: Genistion pilosae, Cisto salviifolii-Ericion cinereae, Telinion monspessulano-linifolii, Sarothamnion scoparii.

4060 - Alpine and Boreal heaths (248 Sites - 53,353 ha)
Sr: Loiseleurio-Vaccinion, Berberidion vulgaris, Ericion carneoae, Daphno oleoidis-Juniperinion alpineae, Rhododendro-Vaccinion, Juniperinion nanae, Gerardion sanguinei.
Note: Dryas octopetala-dominated vegetation should be referred to H6170; for Pinus mugo vegetation on carbonatic substrata see H4070.

4070* - Bushes with Pinus mugo and Rhododendron hirsutum (Mugo-Rhododendretum hirsuti) (99 Sites - 44,377 ha)
Prostrate-ascending, dense, 2-3 (5) m tall, dwarf tree vegetation dominated by Pinus mugo Turra, with a species-poor understory, typical of the detrital limestone slopes in the Subalpine belt of the Alps and Apennine, sometimes also present at lower altitudes.
Sr: Erico-Pininion mugo, Erico-Fraxinion orni, Epipactido atropurpureae-Pinion mugo, Juniperinion nanae.
Note: for Pinus mugo/Rhododendron ferrugineum vegetation on siliceous substrata see H 4060.

4080 - Sub-Arctic Salix spp. scrub (66 Sites - 3,140 ha)
Short-sized vegetation (0.3-2 m) dominated by shrubby willow species, colonizing fresh slopes, long snow-covered, often close to rivers and streams, both on siliceous and carbonatic substrata, in the Subalpine and Alpine belts of the Alps and Apennine, sometimes also at lower altitudes, on scarcely developed soils.
Sr: Salicion pentandrae, Alnion viridis.
Note: subhygrophilous, willow-rich, Alnus viridis-dominated vegetation should be included.

4090 - Endemic oro-Mediterranean heaths with gorse (49 Sites - 16,182 ha)
Dwarf, xerophilous, nanophanerophytic/chamaephytic vegetation dominated by pulvinate, often thorny leguminous species (Astragalus L., Genista L. etc.), both primary and secondary, colonizing the mountain ridges with bedrock outcrops and primitive soils, in the Mediterranean and (exceptionally) Temperate Bioclimates.

5 – Sclerophyllous scrub (Matorral)
This habitat type is subdivided in 4 subgroups: Sub-Mediterranean and temperate scrub (51), Mediterranean arborescent matorral (52), Thermo-Mediterranean and pre-steppe brush (53) and Phrygana (54). A total of 11 Habitats are recognised in Italy, 2 of which have priority status. Worth of note are H5220* (Arborescent matorral with Ziziphus), which is present exclusively in Sicily, and H5410 (West Mediterranean cliff top phryganas (Astragalo-Plantaginetum subulatae)), recorded in Sardinia only.

51 - Sub-Mediterranean and temperate scrub
5110 - Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.) (51 Sites - 7,323 ha)
Shrubby, more or less open vegetation dominated by Buxus sempervirens L., colonizing calcareous (including ultramafic/basaltic) substrata on dry, stony/rocky slopes, from the plain to montane belts, also including pseudomaquis and scrublands where box may be accompanied by other shrub species.
Sr: Cisto cretici-Ericion manipuliflorae, Alyssion bertolonii (incl. Euphorbion ligusticae), Berberidion vulgaris, Cytision sessilfolii.

5130 - Juniperus communis formations on heaths or calcareous grasslands (214 Sites - 24,091 ha)
Shrubby, more or less open, secondary vegetation dominated by Juniperus communis L., generally including grassland patches and shrubby cores of juniper (often with Rosa L., Crataegus L., Prunus L. species), mostly on carbonatic substrata, from the hilly to montane belts.
Sr: Berberidion vulgaris, Cytision sessilfolii (it may include mosaic patches from Festuco-Brometea on calcareous substrata, from Calluno-Ulicetea on siliceous substrata).
Note: for high altitude, dwarf vegetation dominated by Juniperus communis L. var. saxatilis Pall. [= subsp. alpina (Gray) Neir. ex Čelak., = subsp. nana (Willd.) Syme] see H4060.

52 - Mediterranean arborescent matorral
5210 - Arborescent matorral with Juniperus spp. (130 Sites - 48,372 ha)
Mediterranean and sub-Mediterranean, sclerophyllous, dense vegetation organized around arborescent junipers, colonizing steep, often rocky slopes mostly on carbonatic substrata with xeroedaphic conditions.
Sr: Juniperion turbinatae, Oleo-Ceratonion siliquae.
Note: for Juniperus phoenicea L. subsp. turbinata (Guss.) Nyman dominated vegetation see H9560*.

5220* - Arborescent matorral with Ziziphus (3 Sites - 392 ha)
Xerophilous, thorny, shrubby vegetation dominated by Ziziphus lotus (L.) Lam., or other shrub types with Calicotome infesta (C. Presl) Guss., Periploca angustifolia Labill., Euphorbia dendroides L., colonizing various substrata in the Thermo-Mediterranean b.b., only recorded in Sicily.
Sr: Oleo-Ceratonion siliquae, Periplocion angustifoliae.

5230* - Arborescent matorral with Laurus nobilis (25 Sites - 1,086 ha)
Woods and maquis with the tree layer dominated by Laurus nobilis L., colonizing sites where peculiar topographic conditions can mitigate both summer aridity and winter frost, from the Meso-Mediterranean to the Meso-Temperate b.b., on highly variable substrata, often located in gorges and small valleys.
Sr: Populion albae, Fraxino orni-Quercion ilicis, Lauro nobilis-Quercenion virgilianae.
Note: for laurel-dominated shrublands see H5310.

53 - Thermo-Mediterranean and pre-steppe brush
5310 - Laurus nobilis thickets (4 Sites - 221 ha)
Shrubby, species-poor vegetation dominated by Laurus nobilis L. with other Mediterranean thermophilous shrubs, mainly distributed on rocky calcareous substrata with special micro/topoclimatic or edaphic conditions in both Temperate and Mediterranean Macrobioclimates.
Sr: Populion albae, Fraxino orni-Quercion ilicis.
Note: for evergreen holm-oak-dominated forests with laurel in the shrubby understory see H9430.

5320 - Low formations of Euphorbia close to cliffs (74 Sites - 4,931 ha)
Coastal sub-halophitic low shrubby vegetation (garrigue) dominated by chameletic species, colonizing the zone between the sea-exposed cliffs and the Mediterranean maquis/shrublands (with possible expansion inland), with a W-Mediterranean distribution, mainly in the Thermo-Mediterranean b.b.

Sr: *Euphorbion pithyusae*, *Helichryson litorei*, *Antyllidion barba-jovis*.

Note: very rich in rare and localized endemics and therefore to be assimilated with a priority Habitat; for Sardinian endemic garrigues colonizing the cliff tops see H5410.

5330 - Thermo-Mediterranean and pre-desert scrub (384 Sites - 120,473 ha)

Thermo-Mediterranean, discontinuous, garrigue vegetation dominated by shrubs and herbaceous perennials species [including *Ampelodesmos mauritanicus* (Poir.) T. Durand et Schinz - subtype CB 32.23], mainly distributed along the rocky Tyrrenian and Central-S-Adriatic coasts, sometimes reaching inland areas.

Sr: *Lavandulo angustifoliae-Genistion cinereae*, *Avenulo-Ampelodesmion mauritanici*, *Teucrion mari*, *Calicotomo villosae-Genistion tyrrhenae*, *Oleo-Ceratonion siliquae*.

54 - Phrygana

5410 - West Mediterranean clifftop phryganas (*Astragalo-Plantaginetum subulatae*) (6 Sites - 223 ha)

W-Mediterranean, short-sized pulvinate garrigue vegetation, rich in rare endemic species [e.g. *Astragalus tragacantha* L. subsp. *terraccianoii* (Vals.) Jeann., *Centaurea horrida* Badarò], strictly localized on the top of the cliffs and rocky areas in the Thermo-Mediterranean b.b.

Sr: *Euphorbion pithyusae*.

Note: to be assimilated with a priority Habitat.

5420 - *Sarcopoterium spinosum* phryganas (14 Sites - 1,827 ha)

Primary and secondary short-sized pulvinate garrigue vegetation dominated by *Sarcopoterium spinosum* (L.) Spach, colonizing dry and scarcely developed substrata, with a mainly E-Mediterranean distribution, in the Thermo/Meso-Mediterranean b.b.

Sr: *Cisto cretici-Ericion manipuliflorae*, *Cisto eriocephali-Ericion multiflorae*, *Oleo-Ceratonion siliquae*.

5430 - Endemic phryganas of the *Euphorbio-Verbascion* (49 Sites - 17,316 ha)

Thermophilous, edapho-xerophilous, pulvinate, often thorny, shrubby vegetation dominated by chamaephytic/nanophanerophytic species, colonizing coastal and hilly sites on different types of substrata, with a Central and E-Mediterranean distribution, in the Thermo-Mediterranean b.b.

Sr: *Teurcition mari*.

Note: extremely rare, only partially known.

6 - Natural and semi-natural grassland formations

This rich, heterogeneous type contains 5 subgroups: Natural grasslands (61), Semi-natural dry grasslands and scrubland facies (62), Dehesas (63), Semi-natural tall-herb humid meadows (64) and Mesophile grasslands (65). Italy counts 15 Habitats, including 5 with priority status. These habitats are found mainly in the Alps and Apennines, in areas where grazing and cutting practices prevent the vegetation from naturally evolving into woodland communities.

61 - Natural grasslands

6110* - Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion albi* (184 Sites - 9,886 ha)

Xero-thermophilous, pioneer, discontinuous, therophytic/succulent grasslands rich in lichen and moss species, colonizing mainly calcareous (less frequently volcanogenic or ophiolitic) rocky outcrops, with a wide distribution, mostly from the Meso-Mediterranean to the Supra-Temperate b.b.

Sr: *Alysso allyssoidis-Sedion albi*.

Note: for very poor cover values on siliceous substrata see H8230.

6130 - Calaminarian grasslands of the *Violetalia calaminariae* (7 Sites - 972 ha)

Open, herbaceous/sub-fruticose perennial vegetation, colonizing rocky outcrops or gravel/pebble deposits or even mining spoil-heaps, on substrata particularly rich in heavy metals (e.g. ophiolite), characterized by a highly specialized flora (metallophyte), mainly distributed in N-W-Italy.

Sr: the actually representative alliances of the order *Violetalia calaminariae* in Italy are still to be investigated.

6150 - Siliceous alpine and boreal grasslands (118 Sites - 49,981 ha)

Acidophilic, sometimes discontinuous, hemicyryptophytic perennial grasslands, colonizing soils derived from siliceous or decarbonated substrata, often affected by long snow cover, mostly in the Alps and rarely in the N-Apennine, generally at high altitude, in the Oro- and Crioro-Temperate b.b.

Sr: *Festucion variae*, *Agrostion schraderianae*, *Caricion curvulae*, *Salicion herbaceae*, *Nardion strictae* (only for the Crioro-Temperate communities).

6170 - Alpine and subalpine calcareous grasslands
62 - Semi-natural dry grasslands and scrubland facies

6210(*) - Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites) (665 Sites - 253,233 ha)

Calcareous, species-rich, from xero- to mesophilous, mainly hemicyryptophytic, perennial secondary grasslands, colonizing soils derived from various base-rich substrata, distributed in the Apennine (with endemic syntaxa) and the Alps, from Mesosub-Mediterranean to Supra-Temperate b.b.

Sr: Xerobromion erecti, Phleo ambigui-Bromion erecti, Bromion erecti, Festuco amethystinae-Bromion erecti, Cirio-Brachypodion pinnati, Diplachnion serotinae.

Note: the order Festuco-Brometalia doesn’t correspond to any phytosociological syntaxon currently in use: since the Manual EUR/27 explicitly indicates also the order Festucetalia valesiacae, the phytosociological reference must include the whole class Festuco-Brometalia.

6220* - Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea (612 Sites - 187,791 ha)

Small-sized, discontinuous, xero-thermophilous, both annual and perennial grasslands, on various, mostly calcareous, base-rich substrata, in the Thermo-, Meso-, Supra- and Mesosub-Mediterranean b.b., mainly distributed in coastal and subcoastal sectors of peninsular/insular Italy, also reaching inland areas mainly between the Meso- and Supra-Temperate b.b.


Note: for perennial tall-sized grasslands dominated by Ampelodesmos mauritanicus (Poir.) T. Durand et Schinz (CB32.23) see H5330.

6230* - Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) (229 Sites - 45,657 ha)

Dense, mesophilous, perennial grasslands dominated by Nardus stricta L., colonizing flat or slightly steep areas with acidic soils derived from siliceous or leached carbonatic substrata, in the Alps and the Apennines, from the Meso to Oro-Temperate b.b.

Sr: Violion caninae, Nardo-Agrostion tenuis, Ranunculion pollinis-Nardion strictae, Nardion strictae (the last only for Subalpine aspects of Sieversio-Nardetum strictae).

6240* - Sub-pannonic steppic grasslands (18 Sites - 1,025 ha)

Continental, xeric grasslands, rich in chamaephytic and shrubby species, dominated by Festuca valesiaca Schleich. ex Gaudin or Spica L. sp. pl., colonizing very thin humic soils on rocky layers, in windy ridges and exposed sites of the inland Alpine valleys.

Sr: Cirio-Brachypodion pinnati, Festucion valesiacae, Stipo-Poio xerophiler, Stipo-Poio carniciolae.

62A0 - Eastern sub-mediterranean dry grasslands (Scorzonaretalia villosae) (20 Sites - 8,242 ha)

Illyrian-Adriatic, xeric grasslands, with a Balkanic imprint and an Eastern distribution, both in NE- and SE-Italy, rich in endemic species particularly in the southernmost areas (Apulia Region), mostly in the Mesosub-Mediterranean b.b.

Sr: Saturejion subspicatae, Centaureion dichroanthae, Hippocrepido glaucae-Stipion austroitalicae, Hypochoeridion maculatae, Scorzoneron villosae, Violo pseudogracilis-Bromopsion capriniae.

63 - Sclerophyllous grazed forests (dehesas)

6310 - Dehesas with evergreen Quercus spp. (63 Sites - 16,256 ha)

Wooded pastures with sparse evergreen oaks (Quercus suber L., Q. ilex L., Q. coccifera L.), indifferent to the substratum, maintained by the grazing cattle, mainly distributed in the Tyrrhenian areas, from the Thermo- to Supra-Mediterranean b.b.

Sr: Fraxino orni-Quercion ilicis, Juniperion turbinatae, Echino plantaginei-Galactition tomentosae, Trifolio subterranei-Periballion.

64 - Semi-natural tall-herb humid meadows

6410 - Molinia meadows on calcareous, peaty or clayey-siltladen soils (Molinio caeruleae) (178 Sites - 7,552 ha)

Nutrient-poor, hayed or grazed meadows, dominated by Molinia caerulea (L.) Moench, colonizing more or less moist, clayey/silty or peaty soils, both on siliceous and carbonatic substrata, from plain to timberline, mainly between the Meso- and Supra-Temperate b.b.
Sr: Molinion coeruleae, Juncion acutiflori.

6420 - Mediterranean tall humid herb grasslands of the Molinion-Holoschoenion (119 Sites - 6,986 ha)
Mediterranean rush-beds and other hygrophilous, tall-sized grasslands, able to stand temporary phases of soil aridity, colonizing sandy-clayey soils, mainly distributed in the coastal retro-dune systems but also in inland wet areas.
Sr: Molinion-Holoschoenion vulgaris.

6430 - Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (472 Sites - 27,275 ha)
Hygro-nitrophilous, tall-sized vegetation dominated by megaphorph species, mainly colonizing the edge of rivers and mesophilous forests, with a wide altitudinal and climatic range.

65 - Mesophile grasslands
6510 - Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) (260 Sites - 28,238 ha)
Perennial, mesophilous, regularly mowed and sometimes even grazed, non-intensively fertilized, species-rich meadows and pastures, distributed from the plains to low mountain zone, from the Meso- to Supra-Temperate b.b.
Sr: Arrhenatherion elatioris, Ranunculo neapolitani-Arrhenatherion elatioris, Ranunculion velutini, Plantaginion cupanii.
Note: the strongly disturbed, N-rich environments should not be included.

6520 - Mountain hay meadows (153 Sites - 17,146 ha)
Perennial, mesophilous, regularly mowed and sometimes even grazed, species-rich meadows and pastures, distributed on the mountains at higher altitude than H6510, from the Supra- to Oro-Temperate b.b.
Sr: Polygonono-Trisetion.

7 – Raised bogs and mires and fens
This type is divided in 3 subgroups, 2 of which are present in Italy: Sphagnum acid bogs (71) and Calcareous fens (72). Eight Habitats have been recorded, 4 with priority status. They are found mostly in the Alps and Apennines, in areas where climate and soil water availability allow the development of these plant communities.

71 - Sphagnum acid bogs
7110* - Active raised bogs (50 Sites - 556 ha)
Actively peat-forming, ombrotrophic (= mainly fed by rainwater) raised bogs, dominated by species of the genus Sphagnum L., colonizing acidic, mineral-poor waters, in the Supra-, Oro- and Crioro-Temperate b.b., mainly distributed in the Alps and N-Apennine.
Sr: Sphagnion medii, Caricion davallianae p.p., Caricion fuscae p.p. (the last 2 only in very exceptional cases).
Note: also temporarily inactive bogs should be included.

7120 - Degraded raised bogs still capable of natural regeneration (2 Sites - 1 ha)
Actively peat-forming, ombrotrophic raised bogs, dominated by species of the genus Sphagnum L., with the same characteristics as H7110* but where a reversible hydrological, structural or floristic deterioration took place, mostly for anthropogenic causes.

7130(*) - Blanket bogs (* if active bog) (not present)
This Habitat has to be excluded from the Italian territory, in spite of former misinterpretations. Fragments of blanket-like bogs, dominated by species of the genus Sphagnum L., should be referred to H7110, H7120 or H7140.

7140 - Transition mires and quaking bogs (171 Sites - 4,227 ha)
Mixed ombrotrophic/minerotrophic (= fed both by rain/groundwater) bogs, forming peat deposits and floating mats, generally dominated by bryophytic species, with oligotrophic to mesotrophic waters, in the Supra-, Oro- and Crioro-Temperate b.b., in the Alps, Apennine and Islands (fragments).
Sr: Caricion davallianae, Caricion fuscae, Caricion lasiocarpae.
Note: this Habitat includes also E2.23.

7150 - Depressions on peat substrates of the Rhynchosporion (53 Sites - 636 ha)
Pioneer perennial vegetation with Rhynchospora alba (L.) Vahl, R. fusca (L.) W.T. Aiton, Drosera intermedia Hayne, D. rotundifolia L. and others, colonizing depressions on peat or sandy bare substrata with oligotrophic waters, in the Supra-, Oro- and Crioro-Temperate b.b.
Sr: Rhynchosporion albae.
Note: it should be assimilated with a priority Habitat

7160 - Fennoscandian mineral-rich springs and springfens (not present)
Due to its very precise biogeographic definition, the occurrence of this Habitat in Italy has to be excluded. However, similar vegetation types related to non-calcareous spring environments are indeed present in some Regions (mostly in the Alps but also in Calabria, for instance) and urge for a proper acknowledgement.

72 - Calcareous fens
7210* - Calcareous fens with Cladium mariscus and species of the Caricion davallianae (61 Sites - 1,494 ha)
Azonal emergent perennial vegetation dominated by Cladium mariscus (L.) Pohl, colonizing the shores of lakes and marsh areas with calcareous water, mainly distributed in the Temperate bioclimatic Region and exceptionally in the Mediterranean.
Sr: Phragmition communis, Scirpion compacti, Magnocaricion elatae.
Note: when dominated by species of Caricion davallianae see H7230.

7220* - Petrifying springs with tufa formation (Cratoneurion) (110 Sites - 3,483 ha)
Springs and dripping walls with tufa/travertine formation for deposition of calcium carbonate, colonized by bryophytic hygro-hydrophilic vegetation, usually in shady locations in gorges, rocky walls, cliffs, on different types of substrata, on a wide distribution in southern Europe.
Sr: Cratoneurion commutati.

7230 - Alkaline fens (187 Sites - 6,425 ha)
Alkaline fens associated with wetland systems, mostly dominated by calcicolous, peat-forming small-sized sedges and brown mosses, growing on permanently flooded soils, with soligenous/topogenous, base-rich water, with a superficial groundwater table, mainly in the Temperate Macrobioclimatic Region.
Sr: Caricion davallianae, Caricion fuscae.
Note: in the Apennine this Habitat is represented by species-poor fragments.

7240* - Alpine pioneer formations of Caricion bicoloris-atrofuscaceae (24 Sites - 445 ha)
Alpine pioneer perennial sedge vegetation, developed on neutral to sub-acidic, from sandy/clayey or even peaty substrata, soaked in cold water, with long-frozen soils, along spring or stream shores, in the Oro- and Crioro-Temperate b.b.
Sr: Caricion bicoloris-atrofuscaceae.

8 - Rocky habitats and caves
This habitat type is divided in 3 subgroups: Scree (81), Rocky slopes with chasmophytic vegetation (82) and Other rocky habitats (83), all of which are found in Italy (a total of 11 Habitats, only 1 with priority status). If we exclude H8330 (Submerged or partially submerged sea caves) and some sea cliffs, these Habitats are mostly recorded in mountain zones, where scree and rupicolous areas are more common.

81 - Scree
8110 - Siliceous scree of the montane to snow levels (Androsacetalia alpinæ and Galeopsetalia ladani) (147 Sites - 76,167 ha)
Siliceous debris cones and screees colonized by perennial herbaceous, mostly open, pioneer vegetation, with an Alpine and C-Apenninic distribution, mainly in the Oro- and Crioro-Temperate b.b.
Sr: Galeopsion segetum, Androsacion alpinæ, Allosuro crispi-Athyron alpestris, Festucion dimorphae (the last only for the association Achilleo mucronulatae-Saxifragetum aizoidis).

8120 - Calcareous and calcshist scree of the montane to alpine levels (Thlaspietea rotundifoliæ) (156 Sites - 61,006 ha)
Calcareous, calc-schistic or marly debris cones and mobile screees colonized by perennial herbaceous, mostly open, from meso/xerophytic to meso/hygrophytic, pioneer vegetation, with an Alpine and Apenninic distribution, from the Montane- to Crioro-Temperate b.b.
Sr: Festucion dimorphae, Thlaspiion rotundifoliæ, Drabion hoppeanae, Gymnocarpion robertianii.
Note: in the Apennine it should be assimilated with a priority Habitat.

8130 - Western Mediterranean and thermophilous scree (193 Sites - 16,078 ha)
Warm-exposed screees, debris cones, detritic soils on different types of substrata, colonized by perennial herbaceous, mostly open, thermophilous, pioneer vegetation, with an Alpine and Apenninic distribution.
Sr: Dryopteridion oreadis, Stipion calamagrostis, Silicion marginatae, Linario purpureae.

8160* - Medio-European calcarous scree of hill and montane levels (not present)
Due to its very precise biogeographic definition, the occurrence of this Habitat in Italy (recorded for 14 Sites - 4,178 ha) has to be excluded. In similar environments, the Italian vegetation can be properly referred to H8120 and H8130.

82 - Rocky slopes with chasmophytic vegetation
8210 - Calcareous rocky slopes with chasmophytic vegetation (530 Sites - 160,161 ha)
Calcareous rocky outcrops, walls and slopes, colonized by perennial chasmophytic vegetation, with a wide altitudinal range from the sea level in the Mediterranean Regions to the highest peaks in the
Alps.
Sr: *Campanulion versicoloris*, *Potentillion caulescentis*, *Saxifragion lingulatae*, *Saxifragion australis*, *Androsoco-Drabion tomentosae*, *Violo biflorae-Cystopteridion alpinae*, *Dianthon ripulicolae*, *Centauereion pentajectylis*, *Caro multiflori-Aurinion megalocarpeae*, *Centaureo-Campanulion*, *Asperulion garganicae*, *Centaureo-Micromerion cordatae*, *Polypodion serrati*, *Arenarion balearicae.*
Note: according to Eunis Habitat Classification (Davis et al., 2004) it includes also ultra-basic substrata.

### 8220 - Siliceous rocky slopes with chasmophytic vegetation (219 Sites - 69,806 ha)
Siliceous, carbonate-poor, rocky outcrops, walls and slopes, colonized by perennial, moss- and lichen-rich, pioneer, sparse vegetation with very low cover values, widely distributed in different climatic areas, mostly from the Crioro- to Meso-Temperate b.b.
Sr: *Asplenion septentrionalis*, *Androsacion vandelli*, *Saxifragion pedemontanae*, *Potentillion crassinerviae*, *Asplenion serpentin*, *Phagnum saxatilis- Cheilanthion maderensis*, *Linarion caprariae*, *Pohlio crudae-Asplenion septentrionalis*.

### 8230 - Siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* or of the *Sedo albi-Veronicion dilleni* (142 Sites - 11,807 ha)
Siliceous, carbonate-poor, often actively eroded (especially by wind action) rocky outcrops colonized by perennial, moss- and lichen-rich, pioneer, very open vegetation with very low cover values, widely distributed in different climatic areas, mostly from the Crioro- to Meso-Temperate b.b.
Sr: *Sedo-Scleranthion biennis*, *Arabidopsidion thalianae*, *Parmelion conspersae*, *Umbilicario clyndricae*.
Note: this Habitat includes also CB62.3.

### 8240* - Limestone pavements (77 Sites - 13,921 ha)
Calcareous, flat or sub-horizontal rocky outcrops generally affected by karstic processes, colonized by perennial, often moss- and lichen-rich, pioneer, very open vegetation, with a wide distribution in different climatic areas, mostly from the Crioro- to Meso-Temperate b.b.
Sr: this Habitat has a mainly geomorphological characterization and can involve many different vegetation classes: *Asplenietea trichomanis*, *Mulgedio-Aconiteta*, *Trifolio-Geranieta*, *Kobresio-Seslerietes*, *Festuco-Brometa*, *Rhamno-Prunet*, *Querco-Fagettea*, *Salicetoea herbaceae*, *Ceniditeae mollusci*, *Neckeritea complanatae*.

### 83 - Other rocky habitats
#### 8310 - Caves not open to the public (197 Sites - 15,699 ha)
Caves (including groundwater bodies, when present) not available for touristic visits, mainly colonized by endemic specialized animal species and hosting plant communities (with algal, bryophytic, vascular species) only close to their entrance.
Sr: *Adiantion capilli-veneris*, *Violo biflorae - Cystopteridion alpinae*.

### 8320 - Fields of lava and natural excavations (24 Sites - 7,763 ha)
Environments originated by recent volcanic activity, colonized by pioneer, species-poor, mostly endemic-rich communities, often with nutrient-rich, permeable soils, whose ecological features depend on the site’s geological and biogeographical peculiarity.
Sr: *Rumici-Astragalion siculi*, *Parmelion conspersae*, as well as different vegetational aspects to be referred to the classes: *Tubetario guttaeae*, *Cladonio digitatae* *Leptodiozetae repantis*, *Ceniditeae mollusci*, *Campylopeteae vaporarui*, *Grimmietea alpestris*, *Ceratodontum purpurei-Polytrichetae piliferi*.
Note: the subtype corresponding to CB66.6 “fumarole” should be assimilated with a priority Habitat.

### 8330 - Submerged or partially submerged sea caves (66 Sites - 2,569 ha)
Caves submerged at least at high tide, with a more or less dark environment, whose walls, vault and bottom are generally colonized by calcicolous or not, more or less sciophilous, algal communities.
Sr: *Lithophylium stictaformis*, *Peyssonelion squamariae*, *Schotherion nicaeensis*, *Ralfsion verrucosae*.

### 8340 - Permanent glaciers (41 Sites - 30,228 ha)
Glaciers (including the sidewalls), more or less covered by debris, colonized by fungal/algae coenosae.
Sr: the habitat is lacking in phanerogamic vegetation; the algal genera *Chlamydomonas* Ehrenb., *Chloromonas* C. Gobi, several diatoms and the fungal species *Chionaster nivalis* (Bohl.) Wille, *C. bicornis* Kol., *Selenotila nivalis* Lagerh. 1892 can be mentioned.

### 9 – Forests
The last type comprises the forest communities, which are divided in 6 subgroups, 5 of which are present in Italy: Forests of Temperate Europe (91), Mediterranean deciduous forests (92), Mediterranean sclerophyllous forests (93), Temperate mountainous coniferous forests (94) and Mediterranean and Macaronesian mountainous coniferous forests (95). The overall number of Habitats recognised in Italy is 39, 9 of which have priority status. Some are typical of the Apennines, e.g. H9210* (Apennine beech forests with *Taxus* and *Ilex*), H9220* (Apennine beech...
forests with *Abies alba* and beech forests with *Abies nebrodensis* and H9510* (Southern Apennine *Abies alba* forests).

91 - Forests of temperate Europe

9110 - Luzulo-Fagetum beech forests (146 Sites - 48,356 ha)

Pure or mixed beech forests, sometimes with conifers, on siliceous carbonate-poor substrata, colonizing oligo-mesotrophic to oligotrophic, acidic soils, with a mainly Alpine (N-Apenninic only for the CB41.171) distribution, from the Meso- to Supra-Temperate b.b.

Sr: Luzulo-Fagion sylvaticae.

9120 - Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion roboripetraeae* or *Ilici-Fagenion*) (3 Sites - 1,786 ha)

Pure or mixed beech forests, sometimes with firs [*Abies alba* Mill., *Picea abies* (L.) H. Karst.], colonizing eutrophic or meso-eutrophic soils, with a species-rich herb layer, mainly Alpine distribution, from the Meso- to Supra-Temperate b.b.

Sr: Luzulo-Fagion sylvaticae, Quercion roboris.

9130 - Asperulo-Fagetum beech forests (73 Sites - 27,495 ha)

Pure or mixed beech forests, sometimes with firs [*Abies alba* Mill., *Picea abies* (L.) H. Karst.], colonizing eutrophic or meso-eutrophic soils, with a species-rich herb layer, mainly Alpine distribution, from the Meso- to Supra-Temperate b.b.

Sr: Fagion sylvaticae.

9140 - Medio-European subalpine beech woods with *Acer* and *Rumex arifolius* (15 Sites - 1,557 ha)

Pure or mixed beech forests, sometimes low-growing, often with *Acer pseudoplatanus* L., colonizing fresh slopes or valleys affected by snowsliding and snow accumulation, generally close to the timberline, on wet clay-rich soils, with a rich megaphorbid layer, with Alpine distribution.

Sr: Fagion sylvaticae.

9150 - Medio-European limestone beech forests of the Cephalanthero-Fagion (94 Sites - 43,669 ha)

Xero-thermophilous, calcicolous beech forests, colonizing steep slopes with thin soils, standing an alternation of wet/dry periods, with Alpine distribution, from the Meso- to Supra-Temperate b.b.


9160 - Sub-Atlantic and medio-European oak or oakhornbeam forests of the *Carpinion betuli* (89 Sites - 9,370 ha)

Oak-hornbeam forests colonizing valleys and foothills on hydromorphic, silty-clayey colluvial soils with superficial groundwater table, with *Quercus robur* L., sometimes *Q. petraea* (Matt.) Liebl., and a rich early-flowering geophytic layer, mainly in CW-Po Valley, in the Meso-Temperate b.b.

Sr: Alnion incanae, Carpinion betuli.

Note: old-growth or particularly species-rich forests should be assimilated with a priority Habitat.

9170 - Galio-Carpinetum oakhornbeam forests (1 Sites - 123 ha)

More or less acidophilic forests dominated by *Quercus petraea* (Matt.) Liebl. with *Carpinus betulus* L., colonizing mature soils on the bottom of Alpine valleys, in the Meso-Temperate b.b., in territories with subcontinental characteristics.

Sr: Carpinion betuli.

9180* - Tilio-Acerion forests of slopes, screes and ravines (199 Sites - 18,211 ha)

Mesophilous mixed forests with maple, lime, ash, colonizing the bottom of small valleys and humid gorges with moss-rich rocky ground, mainly distributed in the Alps (external ridge) and less frequently in the Apennine, from the Meso- to Supra-Temperate b.b.

Sr: Tilio platyphylli-Acerion pseudoplatani, Lauro nobilis-Tilion platyphylli, Tilio-Ostryon carpinifoliae.

9190 - Old acidophilous oak woods with *Quercus robur* on sandy plains (14 Sites - 1,179 ha)

Acidophilous forests dominated by *Quercus robur* L. and *Betula pendula* Roth with *Quercus petraea* (Matt.) Liebl., colonizing Mindel fluvio-glacial terraces between the Prealpinic moraines and the high Po Valley with leached, nutrient-poor, acidic soils, in continental-temperate climatic conditions.

Sr: Quercion roboris.

91B0 - Thermophilous *Fraxinus angustifolia* woods (13 Sites - 3,184 ha)

Riparian thermo-hygrophilous forests dominated by Mediterranean ash tree, colonizing moist soils, mainly along the terminal sections of rivers and near the estuaries, in the Meso- and Mesosub-Mediterranean b.b.

Sr: Populion albae, Fraxinion angustifoliae.

Note: also the forests dominated by *Fraxinus angustifolia* Vahl subsp. oxycarpa (Willd.) Franco et Rocha Afonso should be taken into account; for alluvial, long flooded ash forests see H91F0.

91D0* - Bog woodland (47 Sites - 920 ha)

Forested peatlands including forest/shrubland mosaics, on moist, peaty, acidic, oligotrophic soils, with a constantly high water table, often with *Pinus*
Sr: *Sphaginion medii, Betulion pubescensis.*

**91E0** - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae, Salicion albae*) (458 Sites - 25,219 ha)
Swampy/riparian forests dominated by species of the genera *Alnus* Mill., *Salix* L., *Fraxinus* L., along the plain, hilly, mountain banks of rivers and lakes, on alluvial, frequently flooded soils, with high water table, mainly in Temperate, sometimes Mediterranean, bioclimatic conditions.
Sr: *Alnion glutinosae, Salicion albae, Alnion incanae, Osmundo-Alnion glutinosae.*
Note: this Habitat includes also CB44.5 and CB44.91.

**91F0** - Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia,* along the great rivers (*Ulmenion minoris*) (104 Sites - 9,058 ha)
Riparian, meso-hygrophylic mixed forests colonizing the banks of middle/final stretches of large rivers, clearly pertaining to the river’s dynamics even when represented by local slacks, on alluvial, exceptionally flooded, silty/sandy soils.
Sr: *Populion albae, Fraxion angustifoliae, Alnion incanae, Alno-Quercion roboris.*

**91H0** - Pannonian woods with *Quercus pubescens* (71 Sites - 11,670 ha)
Edapho-xerophilous sparse forests dominated by *Quercus pubescens* Willd., rich in Eastern, Submediterranean and C-European species, colonizing the inland valleys of the E-Alps, with a Temperate macrobioclimate, in areas with a continental character.
Sr: *Carpinion orientalis* p.p. (only for *Seslerio autumnalis-Ostryenion carpinifolii, Ostryo-Carpinion orientalis*).
Note: for climatic/biogeographic reasons, it’s absent in the Peninsular Regions, where it is replaced by H91AA*.

**91K0** - Illyrian *Fagus sylvatica* forests (Aremonio-Fagion) (46 Sites - 23,832 ha)
SE-Alpine beech forests, sometimes with conifers, with a species-rich herb layer, including many Illyrian and S-European species, colonizing calcareous or flysch substrata, generally on well developed soils, only in the Eastern Alps, mostly in the Supra-Temperate b.b.
Sr: *Arenonio-Fagion sylvaticae* p.p. (only for *Epimedio-Fagion, Lamio orvalae-Fagion, Saxifrago rotundifoliae-Fagion, Ostryo carpinifoliae-Fagion*)
Note: for the non-Illyric N-C-Apenninic beech forests, also included in *Aremonio-Fagion,* see H9210*.

**91L0** - Illyrian oak-hornbeam forests (*Erythronio-Carpinion*) (65 Sites - 12,521 ha)
Sr: *Erythronio dentis-canis-Carpinion betali, Phyllospermo vericillati-Quercion cerris.*

**91M0** - Pannonian-Balkanic turkey oak-sessile oak forests (78 Sites - 34,042 ha)
Sr: *Teucrio siculi-Quercion cerridis.*

**91AA** - Eastern white oak woods (110 Sites - 29,014 ha)
Sr: *Fraxino orni-Quercion ilicis, Pino calabricae-Quercion congestae, Carpinion orientalis* p.p. (only for *Cytiso sessilifoli-Qeruion pubescentis, Lauro nobilis-Quercion virgiliana, Campanulo mediae-Ostryenion carpinifolii*).
Note: not to be mistaken with H91H0*, which is present only in the continental inner Alpine valleys.

**92** - MEDITERRANEAN DECIDUOUS FORESTS

**9210** - Apennine beech forests with *Taxus* and *Ilex* (241 Sites - 189,868 ha)
Thermophilous beech forests, often with *Taxus baccata* L. and *Ilex aquifolium* L. in the shrub layer, rich in SE-European (Apennino-Balkanic) and Mediterranean species, with a mainly Apenninic distribution, on calcareous, marly or siliceous substrata, mainly in the Supra-Temperate climatic belt.
Sr: *Arenonio-Fagion sylvaticae* p.p. (only for *Cardamino kitaibelii-Fagion), Geranio versicoloris-Fagion sylvaticae.*

**9220** - Apennine beech forests with *Abies alba* and beech forests with *Abies nebrodensis* (73 Sites - 27,756 ha)
Mixed beech forests with autochthonous fir species, rich in orophytes and endemics, with a fragmented distribution along the Apennine, mainly in the Supra-Temperate climatic belt, in Sicily also in the Supra- and Orio-Mediterranean.

Sr: Aremonio-Fagion sylvestrae (for Cardamino kitaibellii-Fagetion), Lazuco-Fagion (for Lazuco pedemontanae-Fagetum sylvestrae Oberdorfer & Hoffmann 1967 abietetosum albae Arrigoni et al. 1998), Geranio versicoloris-Fagion, Berberidion aetnensis (only for Pinenion calabricae), Pruno prostratae-Juniperion sabinae.

Note: according to the Habitat name, the Sicilian forests with Abies nebrodensis (Lojac.) Mattei must be referred to H9220*; however, they might find a more suitable arrangement in H9510*.

9250 - Quercus trojana woods (6 Sites - 41,057 ha)
Meso/xerophilous, thermophilous, subacidophilic forests with Quercus trojana Webb and often Q. virgiliana (Ten.) Ten., strictly localized in SE-Italy, colonizing red Mediterranean soils, in the Meso-Mediterranean b.b.
Sr: Fraxino orni-Quercion ilicis, Carpinion orientalis

9260 - Castanea sativa woods (348 Sites - 126,919 ha)
Acidophilic forests dominated by Castanea sativa Mill. (including plantations for fruit/wood, provided they have a spontaneous, autochthonous herb layer) on oligotrophic, siliceous, neutral to acidic, deep soils, with a wide distribution, from the Mesosub-Mediterranean to Supra-Temperate climatic belt.
Sr: Carpinion betulii, Erythronio dentis-canis-Carpinion betulii, Quercion roboris, Carpinion orientalis, Teucrio sici-Quercion cerridis, Erythronio dentis-canis-Quercion petraeae.

9280 - Quercus frainetto woods (not present)
In spite of its name, this Habitat refers to beech-dominated forests with Hungarian oak (corresponding to CB41.1B). Due to misinterpretation, it had been recorded in some Italian Regions (7 Sites - 2,902 ha); however, its occurrence has to be excluded from Italy. The Italian Quercus frainetto Ten. woods should be referred to H91M0.

92A0 - Salix alba and Populus alba galleries (385 Sites - 45,899 ha)
Riparian forests dominated by species of the genera Salix L. and Populus L. distributed along the rivers of the Mediterranean Basin, from the Thermo-Mediterranean to (Sub)Meso-Temperate b.b.
Sr: Salicion albae, Salicion pedicellatae, Populion albae, Alno-Quercion roboris.

92C0 - Platanus orientalis and Liquidambar orientalis woods (Platanion orientalis) (21 Sites - 1,952 ha)
Riparian forests dominated by Platanus orientalis L., strictly localized in SW-Italy, colonizing the banks of perennial rivers along narrow, deeply incised valleys, with peculiar warm/humid mesoecolimatic conditions, in the Thermo- and Meso-Mediterranean b.b.
Sr: Platanion orientalis.
Note: very rare in Italy and therefore to be assimilated with a priority Habitat.

92D0 - Southern riparian galleries and thickets (Nerio-Tamaricetea and Securinegion tinctoriae) (88 Sites - 6,997 ha)
Riparian tall-sized shrubby vegetation dominated by Tamarix gallica L., T. africana Poir., T. canariensis Willd., standing long dry periods, along torrential rivers (or with a widely changeable flow), on scarcely developed alluvial soils, in the Thermo and Meso-Mediterranean b.b.
Sr: Rubo-Nerion oleandri, Tamaricicion africanae.

93 - Mediterranean sclerophyllous forests
9320 - Olea and Ceratonion forests (88 Sites - 14,545 ha)
Arborescent vegetation dominated by Olea europaea L. var. sylvestris Brotn. and Ceratonia siliqua L. with other sclerophyllous species, generally extremely localized and fragmented, colonizing different types of substrata in the Thermo and Meso-Mediterranean b.b.
Sr: Fraxino orni-Quercion ilicis, Oleo-Ceratonion siliquae.

9330 - Quercus suber forests (66 Sites - 31,713 ha)
Open forests and woodlands dominated by Quercus suber L., with a scarce tree cover and rich herb/shrub layers, mostly on acidic soils, with a W-Mediterranean, especially Tyrrenian, distribution, mainly in the Meso- (sometimes Mesosub-) Mediterranean b.b.
Sr: Fraxino orni-Quercion ilicis, Ericion arboreae, Teucrio sici-Quercion cerridis.

9340 - Quercus ilex and Quercus rotundifolia forests (485 Sites - 190,621 ha)
Evergreen forests/maquis dominated by Quercus ilix L., colonizing different types of substrata, from carbonatic/siliceous rocks to sands, widely distributed in the Italian Regions, both in the coastal/subcoastal and inland areas, from the Thermo- to Mesosub-Mediterranean (occasionally Meso-Temperate) b.b.
Sr: Fraxino orni-Quercion ilicis.
Note: in Italy it includes only CB45.31 and CB45.32.

9350 - Quercus macrolepis forests (4 Sites - 130 ha)
Apulian open forests dominated by Quercus
ithaburensis Decne. subsp. macrolepis (Kotschy) Hedge et Yalt (= Q. macrolepis Kotschy), strictly localized in SE-Italy (only few sites in Apulia Region), mainly in the Meso-Mediterranean b.b.
Sr. Fraxino orni-Quercion ilicis.
Note: in Italy it includes only CB41.792.

9380 - Forests of Ilex aquifolium (12 Sites - 2,132 ha)
Relictual tall-sized shrublands or arborescent vegetation dominated by Ilex aquifolium L., sometimes with Taxus baccata L., on different (mostly siliceous) substrata, in the Supra-Mediterranean or Supra-Temperate b.b. with prominent oceanic features.
Sr. Fraxino orni-Quercion ilicis, Geranio versicoloris-Fagion, Pino calabricae-Quercion congestae.

94 - TEMPERATE MOUNTAINOUS CONIFEROUS FORESTS
9410 - Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetum) (153 Sites - 94,819 ha)

Pure or mixed, species-poor forests dominated by Picea abies (L.) H. Karst., also with other conifer species, on both carbonatic and siliceous substrata, distributed in the Alps and NW-Apennine, mainly in the Supra- and Oro-Temperate b.b.
Sr. Piceion abietis, Calamagrostio variae-Abietion.

9420 - Alpine Larix decidua and/or Pinus cembra forests (155 Sites - 63,974 ha)

Pure or mixed forests dominated by Larix decidua Mill. and/or Pinus cembra L., sometimes with Picea abies (L.) H. Karst., or Pinus mugo Turra subsp. uncinata (Ramond ex DC.) Domin (= Pinus uncinata Ramond ex DC.), distributed only in the Alps, mainly in the Oro- (sometimes Supra-) Temperate b.b.
Sr. Erica-Pinion mugo, Piceion abietis.

9430(*) - Subalpine and montane Pinus uncinata forests (* if on gypsum or limestone) (20 Sites - 2,195 ha)

Open forests or tall-sized shrublands dominated by Pinus mugo Turra subsp. uncinata (Ramond ex DC.) Domin (= Pinus uncinata Ramond ex DC.), with a rich dwarf-srubby understory, on carbonatic, siliceous or gypsiferous substrata, distributed only in the Alps, in the Supra- and Oro-Temperate b.b.
Sr. Erica-Pinion mugo, Daphno oleoidis-Juniperion alpinae, Seslerio caeruleae-Pinion uncinatae, Rhododendro-Vaccinion, Juniperion nanae, Ononido-Pinion.

95 - MEDITERRANEAN AND MACARONESIAN MOUNTAINOUS CONIFEROUS FORESTS
9510* - Southern Apennine Abies alba (14 Sites - 3,874 ha)
Relictual forests dominated by Abies alba Mill. mainly distributed in S- and C-Apennine, occupying the same altitudinal belt of the beech forests, mostly in the Supra-Temperate b.b.
Sr. Berberidion aetnensis (for Pinenion calabricae), Artemonio-Fagion, Geranio versicoloris-Fagion.
Note: for the Apenninic beech forests with silver fir, see H9220.

9530* - (Sub-)Mediterranean pine forests with endemic black pines (43 Sites - 12,821 ha)
Heliophilous, pioneer, Apenninic/Alpine forests dominated by species from Pinus nigra J.F. Arnold group, standing extreme environments (rocky ridges, sub-vertical walls) with intense edaphic aridity, when compensated by a high atmospheric humidity, mainly on carbonatic but also crystalline or volcanic substrata.
Sr. Erica-Fraxinon orni, Daphno oleoidis-Juniperion alpinae, Berberidion aetnensis (for Pinenion calabricae), Geranio versicoloris-Fagion.

9540 - Mediterranean pine forests with endemic Mesogeian pines (107 Sites - 32,241 ha)
Mediterranean/thermo-Atlantic sparse forests with Pinus pinaster Aiton, P. pinea L., P. halepensis Mill., P. brutia Ten., with a dense sclerophyllic shrub layer, in the Thermo- and Meso-Mediterranean b.b.; old, naturalized plantations of these species should be included.
Sr. Fraxino orni-Quercion ilicis, Oleo-Ceratonion siliquae, Ericion arboreae, Pinion pineae.
Note: for pinus forests on coastal dunes see H2270*.

9560* - Endemic forests with Juniperus spp. (12 Sites - 594 ha)
Relictual, edapho-xerophilous, tall-sized shrubby vegetation dominated by Juniperus thurifera L., with a W-Mediterranean distribution, in Italy only in Piedmont where it colonizes rocky sites, accompanied by J. phoenicea L. subsp. phoenicea and J. hemisphaerica C. Presl.
Sr. Juniperion thuriferae.

9580* - Mediterranean Taxus baccata woods (11 Sites - 2,840 ha)
Forests dominated by Taxus baccata L., often associated with Ilex aquifolium L., localized in small areas in a context of deciduous or rarely evergreen forests, with a very restricted distribution in SW-Italy and major islands.
Sr. Fraxino orni-Quercion ilicis, Oleo-Ceratonion siliquae, Geranio versicoloris-Fagion sylvaticae, Pino calabricae-Quercion congestae.
Note: for beech forests with yew see H9210*.

95A0 - High oro-Mediterranean pine forests (11 Sites - 2,840 ha)
SE-Mediterranean, relictual, sparse forests dominated by the oromediterranean *Pinus leucodermis* Antoine, with a shrub layer rich in juniper species (often *Juniperus hemisphaerica* C. Presl.), colonizing calcareous/dolomitic rocky substrata, often with poor eroded soils, in sites which benefit from recurring mists.

Sr: *Daphne oleoidis-Juniperion alpinae*.

Note: very rare in Italy and therefore to be assimilated with a priority Habitat; some Authors consider *Pinus leucodermis* Antoine as a variety [*Pinus heldreichii* H. Christ var. *leucodermis* (Antoine) Markgr. ex Fitschen].

Conclusive remarks

The most remarkable aspect of the present paper is the introduction of a standardized, uniform phytosociological reference for all the Annex I Habitats of the 92/43/EEC Directive recognized in the Italian territory. Taking into account the most recent progresses in vegetation science, with a careful link to the National and local biodiversity, it offers a tool to apply the European law at the territorial scale, translating general sovra-national concepts into the peculiar language of the Italian flora, vegetation and landscape.

The alliance proved more and more to be a precious phytosociologic format, with a high interpretative value at a territorial, biogeographic level. It stands as the most suitable syntaxon for ecological analyses at national and regional scale.

By offering a tool for the correct interpretation of the Habitats, the present paper will favour and support a proper application of the “Habitat” Directive, thus supporting and improving the Italian biodiversity conservation and management.

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Appendix 1 - Syntaxonomic scheme

When there is a relation between a syntaxon and a Habitat, the corresponding code is reported in square brackets; this doesn’t imply that the whole syntaxon coincides with that Habitat. A well-grounded correspondence should be supported case by case by the expert’s interpretation.

**CHARETEA FRAGILIS** Fukarek & Kraush 1964  
**CHARLECTALIA HISPIDAE** Sauer & Kraush 1964  
*Charion fragilis* Krausch em. Doll 1989 [1150*] [3140]  
*Charion vulgaris* (Krause & Lang 1977) Krause 1981 [3140]  
*Charion canescentis* Kraush 1964 [1150*] [3140]  
*NITELLETALIA FLEXILIS* Krause 1969  
*Nitellion flexilis* Krause 1969 [3140]

**LEMNETEA Tüxen ex O. Bolös & Masclans 1955**  
**LEMNETALIA MINORIS** O. Bolös & Masclans 1955  
*LEMNION TRISULCAE* Den Hartog & Segal ex Tüxen & Schwabe in Tüxen 1974 [3150]  
*LEMNON MINORIS-HYDROCHARITION MORSUS-RANAEE* Rivas-Martínez, Fernández-González & Loidi 1999 (= *Hydrocharition morsus-ranae* Passarge 1996) [3150]  
*LEMNON MINORIS* Tüxen ex O. Bolös & Masclans 1955 [3150]

**POTAMETEA Klika in Klika & Novák 1941**  
**POTAMETALIA KOCH** Koch 1926  
*Potamion* (Koch 1926) Libbert 1931 [1150*] [3150]  
*Nymphaeion albae* Oberdorfer 1957 [3150]  
*ZANNICHELLION OBSUROFOLIAE* Brullo & Spampinato 1990 [1150*]  
*Ranunculion fluitantis* Neuhausen 1959 [3260]  
*Ranunculion aquatilis* Passarge 1964 (= *Callitricho-Batrachion* Den Hartog & Segal 1964) [3260]  
*UTRICULARIETALIA MINORIS* Den Hartog & Segal 1964
Ceratophyllum demersi Den Hartog & Segal ex Passarge 1996 [3150]
Utricularion vulgaris Den Hartog & Segal 1964 [3150]

RUPPIETEA J.Tüxen 1960
RUPPIETALIA J.Tüxen 1960
Ruppion maritimae Br.-Bl. ex Westhoff in Bennema, Sissingham & Westhoff 1943 [1130] [1150*]
Riellion helicophyllae Cirujano, Velayos & P. García ex Rivas-Martínez, Fernández-González & Loidi 1999 [1150*]

ZOSTERETEA MARINAE Pignatti 1953
ZOSTERETALIA Bèguinot 1941
Zosterion marinae Christiansen 1934 [1110] [1120] [1130] [1140] [1150*] [1160]

LITHOPHYLLETEA Giaccone 1965 emend. Giaccone 1994
LITHOPHYLLETALIA Giaccone 1965
Lithophyllum stictaeformis Giaccone 1965 [1110] [1170] [8330]
RHODYMENIETALIA Boudouresque 1971 emend. Giaccone 1994
Peyssonnelion squamariae Augier e Boudouresque 1975 emend. Giaccone 1994 [1120] [1170] [8330]
Schotterion nicaeensis Boudouresque e Cinelli 1971 emend. Giaccone 1994 [1170] [8330]

CYSTOSEIRETEA Giaccone 1993
Cystoseirion crinitae Molinier 1958 [1120] [1150*] [1160] [1170]
Sargassion hornschuchii Giaccone 1973 [1170]
ULVETALIA Molinier 1958
Ulvia lactevirentis Berner 1931 [1150*] [1170]

ENTOPHYSLIDETEA Giaccone 1993
ENTOPHYSLIDETALIA DEUSTAE Ercegovic 1932
Entophysalidion deustae Ercegovic 1932 [1170]
BANGIETALIA FUSCOPURPUREAE Giaccone 1993
Bangion fuscopurpureae Giaccone 1993 [1170]
RALFSIETALIA VERRUCOSAE Giaccone 1993
Ralfsion verrucosae Giaccone 1993

CAULERPETEA Giaccone & Di Martino 1997
CAULERPETALIA Giaccone & Di Martino 1997
Caulerpion Giaccone & Di Martino 1997 [1110] [1120]

BIDENTETEA TRIPARTITAE Tüxen, Lohmeyer & Preising ex von Rochow 1951
BIDENTETALIA TRIPARTITAE Br.-Bl. & Tüxen ex Klika & Hadac 1944
Bidention tripartitae Nordhagen 1940 em. Tüxen in Poli & J. Tüxen 1960 [3270]
Chenopodion rubri (Tüxen ex Poli & J. Tüxen 1960) Kopecký 1969 [3270]

ISOÈTO-NANOJUNCETEA Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946
ISOÈTETALIA Br.-Bl. 1936
Isoëtion Br.-Bl. 1936 [3120] [3170*]
Presliion cernvae Br.-Bl. ex Moor 1937 [3120] [3170*]
Agrostion salmanticae Rivas Goday 1958 [3120] [3170*]
Cicendion (Rivas Goday in Rivas Goday & Borja 1961) Br.-Bl. 1967 [3120] [3170*]
Cicendio-Solenopsion laurentiae Brullo & Minissale 1998 [3120] [3170*]
NANOCYPERETALIA fusci Klika 1935
Nanocyperion Koch ex Libbert 1933 [3130-2] [3170*]
Verbesson supinae Slavnic 1951 (= Heleochloion Br.-Bl. ex Rivas Goday 1956, Heleochloion Br.-Bl. in Br.-Bl., Roussine & Nègre 1952) [3130-2] [3170*]
Lythrion tribracteati Rivas Goday & Rivas-Martínez ex Rivas Goday 1970 [3130-2] [3170*]
ISOËTO-LITTORELLETA Br.-Bl. & Vlieger in Vlieger 1937
LITTORELLETA Koch 1926
Eleocharitition acicularis Pietsch 1967 [3110] [3130-1]
Isoëtion lacustris Nordhagen 1937 [3110] [3130-1]
Hyperico elodis-Sparganion Br.-Bl. & Tüxen ex Oberdorfer 1957 [3110] [3130-1]

MONTIO-CARDAMINETEALIA Br.-Bl. & Tüxen ex Klika & Hadač 1944
MONTIO-CARDAMINETEA Pawl. 1928
Cratoneurion commutati W. Koch 1928 [7220*]

PHRAGMITO-MAGNOCARICETEALIA Klika in Klika e Novak 1941
PHRAGMITETALIA Koch 1926
Phragmition communis Koch 1926 [7210*]
Scirpinion compacti Dahl & Hadač 1941 corr. Rivas-Martínez, Costa, Castroviejo & E. Valdés 1980 [7210*]
MAGNOCARICETALIA Pignatti 1954
Magnocaricion elatae Koch 1926 [7210*]
NASTURTIO-GLYCERIETALIA Pignatti 1953
Phalaridion arundinaceae Kopechy 1961 [3220]

OXYCOCCO-SPHAGNETEALIA Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946
SPHAGNETALIA MEDII Kästner & Flössner 1933 (= Sphagnetalia magellanicí Kästner & Flössner 1933)
Sphagnion medii Kästner & Flössner 1933 [7110*] [7120] [91D0*]

SCHEUCHZERIO-CARICETEALIA FUSCAE R. Tüxen 1937
CARICETALIA DAVALLIANAE Br.-Bl. 1949
Caricion davallianae Klika 1934 p.p. [7110*] [7120] [7140] [7230]
Caricion bicoloris-atrofuscaceae Nordhagen 1936 (= Caricion juncifoliae Br.-Bl. in Volk 1940, Caricion atrofuscoco-saxatilis Nordhagen 1943) [7240*]
CARICETALIA FUSCAE Koch 1926 em. Br.-Bl. 1949
Caricion fuscae Koch 1926 em. Klika 1934 p.p. [7110*] [7120] [7140] [7230]
SCHCHEUCHZERIETALIA PALUSTRIS Nordhagen 1937
Caricion lasiocarpae Vanden Berghen in Lebrun, Noirfalise, Heinemann & Vanden Berghen 1949 [7140]
Rhynchosporion albae Koch 1926 [7150]

UTRICULARIETEALIA INTERMEDIO-MINORIS Pietsch 1965
UTRICULARIETALIA INTERMEDIO-MINORIS Pietsch 1965
Sphagno-Utricularion Müller & Görs 1960 [3160]
Scorpidio-Utricularion Pietsch 1965 [3160]

AMMOPHILETEALIA Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946
AMMOPHILETALIA AUSTRALIS Br.-Bl. 1933

HELICHRYSETALIA ITALICI Biondi & Géhu in Géhu & Biondi 1994
Euphorbion pithysaue Biondi & Géhu in Géhu & Biondi 1974 [5320] [5410]
Helichryson litorei Biondi 2007 [1240] [5320]
CRUCIANELLETEALIA MARITIMAE Sissingh 1974
Crucianellion maritimae Rivas Goday & Rivas-Martínez 1958 [2130*] [2210]

CAKILETEALIA MARITIMAE Tüxen & Preising ex Br.-Bl. & Tüxen 1952
EUPHORBIETALIA PEPLIS Tüxen 1950
Euphorbion peplis Tüxen 1950 [1210]

Thero-Atriplicion Pignatti 1953 [1210]

CRITHMO-STATICETEAE Br.-Bl. in Br.-Bl., Roussine & Nègre 1952

CRITHMO-STATICETALIA Molinier 1934

Crithmo-Staticion Molinier 1934 [1240]

Crucianellion rupestris Brullo & Furnari 1988 [1240]

Erodio corsici-Limonion articulati Gamisans & Muracciole ex Géhu & Biondi 1994 [1240]

SENECIONETALIA CINERARIAE Biondi 2007

Anthyllidion barbae-jovis Brullo & De Marco 1989 [1240] [5320]

JUNCETEA MARITIMI Br.-Bl. in Br.-Bl., Roussine & Nègre 1952

PUCCINELLIALIA DISTANTIS (Soó 1968) Géhu & Rivas-Martínez 1982

Puccinellion distantis Soó 1933 em. Géhu & Rivas-Martínez 1982 [1340*]

JUNCETALIA MARITIMI Br.-Bl. ex Horvatic 1934

Juncion maritimi Br.-Bl. ex Horvatic 1934 [1410]

Plantaginion crassifoliae Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 [1410]


SAGINETEA MARITIMAE Westhoff, Van Leeuwen & Adriani 1962

FRANKENIETALIA PULVERULENTAE Rivas-Martínez ex Castroviejo & Porta 1976

Frankenion pulverulentae Rivas-Martínez ex Castroviejo & Porta 1976 [1310]

SAGINETALIA MARITIMAE Westhoff, Van Leeuwen & Adriani 1962

Saginion maritimae Westhoff, Van Leeuwen & Adriani 1962 [1310]

CRYPSIDETEAE ACULEATAE Vicherek 1973

CRYPSIDETALIA ACULEATAE Vicherek 1973

Crypsidion aculeatae Pignatti 1954 [1310]


Arthrocnemion macrostachyi Rivas-Martínez 1980 [1130] [1420]

Suaedion verae Rivas-Martínez, Fernández-González & Loidi 1999 [1420] [1430]

LIMONIETALIA BR.-BL. & O. Bolòs 1958

Limoniastrion monopetali Pignatti 1953 [1420] [1430] [1510*]

Triglochino barrelieri-Limonion glomerati Biondi, Diana, Farris & Filigheddu 2001 [1420] [1510*]

Inulion crithmoids Brullo & Furnari 1988 [1510*]

SPARTINETEAE MARITIMAE Tüxen in Beeftink & Géhu 1973

SPARTINETALIA MARITIMAE Conard ex Beeftink & Géhu 1973

Spartinion maritimae Conard ex Beeftink & Géhu 1973 [1130] [1320]


THERO-SUADETALEIA BR.-BL. & O. Bolòs 1958

Salicornion patulae Géhu & Géhu-Franck 1984 [1310]

Microcnemion coralloidis Rivas-Martínez 1984 [1310]

Thero-Suaedion Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 [1310]

ADIANTETEAE BR.-BL. IN BR.-BL., ROUSSINE & NÈGRE 1952

ADIANTETALIA CAPILLI-VENERIS BR.-BL. EX HORVATIC 1934

Adiantion capilli-veneris Br.-Bl. ex Horvatic 1934 [8310]
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ASPLENIE TAE TRICHR MANIS (Br.-Bl. in Meier & Br.-Bl. 1934) Oberd. 1977 [elements of the class can be present in 8240*]


Asplenion septentrionalis Oberd. 1938 [8220]


Saxifragion pedemontanae Barbero & Bono 1967 [8220]

Potentillion crassnerviae Gamisans 1968 [8220]

Asplenion serpentini Br.-Bl. e Tüxen ex Egger 1955 [8220]

CHEILANTHETALIA MARANTHO-MADERENSIS Saenz & Rivas-Martínez 1979


Linarion caprariae Foggi, Cartei, Pignotti, Signorini, Viciani, Dell’Olmo & Menicagli 2006 [8220]

ONOSMETALIA FRUTESCENTIS Quezel 1964

Campanulion versicoloris Quezel 1964 [8210]

POTENTILLETALIA CAULESCENTIS Br.-Bl. in Br.-Bl. & Jenny 1926

Potentillion caulescensis Br.-Bl. & Jenny 1926 [8210]

Saxifragion lingulatae Rioux & Quézel 1949 [8210]

Saxifragion australis Biondi & Ballelli ex Brullo 1983 [8210]

Androsaco-Drabion tomentosae T. Wraber 1970 [8210]

VILO BIFLORAE-CYSTOPTERIDETALIA ALPINAE F. Casas 1970

Violo biflorae-Cystopteridion alpinae F. Casas 1970 (= Cystopteridion fragilis Richard 1972) [8210] [8310]

ASPLENIE TALIA GLANDULOSI Br.-Bl. in Meier & Br.-Bl. 1934

Dianthion rupicolae Brullo & Marcenò 1979 [8210]

Centaureion pentadactylis Brullo, Scelsi & Spampinato 2001 [8210]

Caro multiflori-Aurinion megalocarpae Terzi & D’Amico 2008 [8210]

CENTAUREO KARTSCHIANAE-CAMPANULETALIA PYRAMIDALIS Trinajstic ex Di Pietro & Wagensommer 2008

Centaureo-Campanulion Horvatic 1934 [8210]

Asperulion garganicae Bianco, Brullo, E. & S. Pignatti 1988 [8210]

ARENARIO BERTOLONI-PHAGNALETALIA SORDIDAE Arrigoni e Di Tommaso 1991

Centaureo-Micromerion cordatae Arrigoni e Di Tommaso 1991 [8210]

MULGEDIO-ACONITETE Hadač & Klika in Klika 1948 (= Betulo-Adenostyletae Br.-Bl. & Tüxen 1943) [elements of the class can be present in 8240*]

ADENOSTYLETALIA Br.-Bl. 1930

Rumicion alpini Ruebel ex Klika & Hadač 1944 [6430]

Adenostylyl alliariae Br.-Bl. 1926 [6430]

Salicion pentandrae Br.-Bl. 1967 (= Salicion waldsteinianae Oberd. 1978) [4080]

Alnion viridis Aichinger 1933 [4080]

CALAMAGROSTIETALIA VILLOSAE Pawłowski in Pawłowski, Sokołowski & Walisch 1928

Calamagrostion arundinaceae (Luquet 1926) Jenik 1961 [6430]

ANOMODONTO-POLYPODIETEA CAMBRICI Rivas-Martínez 1975

ANOMODONTO-POLYPODIETALIA O. Bolòs & Vives in O. Bolòs 1957

Polypodion serrati Br.-Bl. in Br.-Bl. Roussine & Négre 1952 [8210]

Arenarion balearicae O. Bolòs & Molinier 1969 [8210]

Pohlio crudae-Asplenion septentrionalis Brullo & Siracusa in Brullo et al. 2001 [8220]

THLASPIETEA ROTUNDIFOLII Br.-Bl. 1948

ANDROSAC ETALIA ALPINAE Br.-Bl. in Br.-Bl. & Jenny 1926

Galeopsion segetum Oberd. 1957 [8110]

Androsacion alpinae Br.-Bl. 1926 [8110]

Allosuro crispi-Athyrion alpestris Nordhagen 1936 [8110]

EPILOBIETALIA FLEISCHERI Moor 1958

Epilobion fleischeri G. Br.-Bl. & J. Br.-Bl. 1931 [3220]

Glaucon flavi Br.-Bl. ex Tchou 1948 [3250]

STIPETALIA CALAMAGROSTIS Oberd. & Seibert in Oberd. 1977


THLASPIETALIA ROTUNDIFOLII Br.-Bl. in Br.-Bl. & Jenny 1926

Silenion marginatae Lakusic 1966 [8130]

Festucion dimorphae Bonin 1969 (= Linario-Festucion dimorphae Avena & Bruno 1975) [8110 only for the Laga Mountains, see Di Pietro et al. (2001)] [8120]

Thlaspietum rotundifolii Jenny-Lips 1930 [8120]

Dracontium hoppeanae Zollitsch 1968


Gymnocarpion robertianii F. Casas 1970 (= Petasition paradoxi Zollitsch ex Lippert 1966) [8120]

PEGANO-SALSOLETEA Br.-Bl. & O. Bolòs 1958

SALSOLO VERMICULATAE-PEGANETALIA HARMALAE Br.-Bl. & O. Bolòs 1954

Salsolo vermiculatae-Peganion harmalae Br.-Bl. & O. Bolòs 1954 [1430]

Artemesion arborescentes Géhu & Biondi 1986 [1430]

STELLARIETEA MEDIAE Tüxen, Lohmeyer & Preising ex von Rochow 1951

THERO-BROMETALIA (Rivas Goday & Rivas-Martínez ex Esteve 1973) O. Bolòs 1975

Echio plantaginei-Galactition tomentosae O. Bolòs & Molinier 1969 [6310]

GALIO-URTICETEA Passarge ex Kopecky 1969


Petasition officinalis Sillinger 1933 [6430]

Bromo ramosi-Eupatorium cannabinum O. Bolòs & Masalles in O. Bolòs 1983 [6430]


Aegopodion podagrariae Tüxen 1967 [6430]

Galio-Alliarion petiolatae Oberdorfer & Lohmeyer in Oberdorfer, Görs, Korneck, Lohmeyer, Müller, Philipp & Seibert 1967 [6430]

Impatienti no-li-tangere-Stachyion sylvaticae Görs ex Mucina in Mucina, Grabherr & Ellmauer 1993 [6430]


TRIFOLIO-GERANIETEA Th. Müller 1961 [elements of the class can be present in 8240*]

ORIGANETALIA VULGARIS Müller 1962

Geranium sanguineum Tüxen ex Müller 1961 [4060]

CARICI RUPESTRIS-KOBRESIETEA BELLARDII Ohba 1974

ELYNETALIA MYOSUROIDIS Oberdorfer 1957

Oxytropido-Elynon (Br.-Bl. (1948) 1949) 1949 [6170]

KOBRESIO MYOSUROIDIS-SESLERIETEA CAERULEAE Br.-Bl. 1948 nom. mut. propos. Rivas-Martínez, T.E. Díaz, Fernandez-Gonzales, Izco, Loidi, Lousã & Penas 2002 (= Festuco-Seslerietea Barbero & Bonin 19698) [elements of the class can be present in 8240*]

SESLERIETALIA TENUIFOLIAE Horvat 1930

Seslerion apenninae Furnari ex Bazzichelli & Furnari 1979 [4090] [6170]
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**SESLERIETALIA CAERULEAE** Br.-Bl. in Br.-Bl. & Jenny 1926
Caricion ferrugineae G. Br.-Bl. & J. Br.-Bl. 1931 [6170]


**CARICETEA CURVULAE** Br.-Bl. 1948 (= Juncetea trifidi Hadac 1946)

FESTUCETALIA VALESIACAE Br.-Bl. & Tüxen ex Br.-Bl. 1949 [6210(*)]

Stipo-Poion xerophilae Br.-Bl. & Tüxen ex Br.-Bl. 1949 [6240(*)]
Stipo-Poion carniolicae Br.-Bl. 1949 [6240(*)]
BRACHYPODO-CHRYSOPOGONETEA Horvatić 1963

SCORZONERO VILLOSAE-CHRYSOPOGONETALIA GRYLLI Horvatić & Horvat in Horvatić 1963 (= Scorzoneretalia villosae Horvatić 1973)

Saturejion subspicatae (Horvat 1974) Horvatić 1975 [2130*] [62A0]

Centaureion dichroanthae Pignatti 1952 [62A0]

Hippocrepido glaucae-Stipion austroitalicae Forte & Terzi 2005 in Forte, Perrino & Terzi 2005 [62A0]

Hypochoeridion maculatae Horvatic ex Terzi 2001 [62A0]

Scorzonerion villosae Horvatić 1963 [62A0]

Violo pseudogracilis-Bromopsion caprinae Terzi 2011 [62A0]


ONONIDETALIA STRIATAE Br.-Bl. 1950

Lavandulo angustifoliae-Genistion cinereae Barbero, Loisel & Quézel 1972 [5330]

Ononidion cenisiae Barbero 1972 [6170]

KOELERIO-CORYNEPHORETEA Klika in Klika & Novák 1941

CORYNEPHORETALIA CANESCENTIS Klika 1934

Koelerion arenariae Tüxen 1937 [2130*]

Corynephorion canescentis Klika 1931 [2330]

POETEA BULBOSAE Rivas Goday & Rivas-Martínez in Rivas-Martínez 1978

POETALIA BULBOSAE Rivas Goday & Rivas-Martínez in Rivas Goday & Ladero 1970

Trifolio subterranei-Periballion Rivas Goday 1964 [6220*] [6310]

Poo bulbosae-Astragalion sesami Rivas Goday & Ladero 1970 [6220*]

Plantaginion serrariae Galán, Morales & Vicente 2000 [6220*]


SEDO-SCLERANTHETALIA Br.-Bl. 1955

Alysso alyssoidis-Sedion albi Oberdorfer & Müller in Müller 1961 [6110*]

Sedo-Scleranthion biennis Br.-Bl. 1955 [8230]

Arabidopsidion thalianae Passarge 1964 [8230]


LYGEO-STIPETALIA Br.-Bl. & O. Bolòs 1958

Thero-Brachypodion ramosi Br.-Bl. 1925 [2240] [6220*]

Polygonion tenoreani Bruullo, De Marco & Signorello 1990 [6220*]

Stipion tenacissimae Rivas-Martínez 1978 [6220*]

Moricandio-Lygeion sparti Bruullo, De Marco & Signorello 1990 [6220*]

HYPARRHENIETALIA HIRTAE Rivas-Martínez 1978


Avenulo-Ampelodesmion mauritanici Minissale 1994 [5330]

VIOLETALIA CALAMINARIAE Br.-Bl. & Tüxen ex Ernst 1965 [= Violeta calaminariae Lohmeyer, A. & W. Matuszkiewicz, Merker, Moore, Müller, Oberdorfer, Poli, Seibert, Sukopp, Trautmann, J. Tüxen, Tüxen & Westhoff 1962 (art. 8)]

VIOLETALIA CALAMINARIAE Br.-Bl. & Tüxen 1943 [6130]

MOLINIO-ARRHENATHERETEAE Tüxen 1937

ARRHENATHERETALIA Tüxen 1931

Arrhenatherion elatioris Koch 1926 [6510]

Ranunculo neapolitani-Arrhenatherion elatioris Allegrezza & Biondi 2011 [6510]

TRIFOLIO-HORDEETALIA Horvatic 1963
Ranunculion velutini Pedrotti 1976 [6510]
*CIRSIETALIA VALLIS-DEMONIS* Brullo & Grillo 1978

Plantaginion cupanii Brullo & Grillo 1978 [6510]

*POO ALPINAE-TRISETETALIA* Ellmayer & Mucina 1993

Polygono-Trisetion Br.-Bl. & Tüxen ex Marshall 1947 nom. inv. [6520]

*PASPALO-HELEOCHLOETALIA* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952


*HOLOSCHONETALIA VULGARIS* Br.-Bl. ex Tchou 1948

Molinio-Holoschoenion vulgaris Br.-Bl. ex Tchou 1948 [6420]

*MOLINIETALIA CAERULEAE* Koch 1926

Calthion palustris Tüxen 1937 em. Bal.-Tul. 1978 [6430]

Molinion coeruleae Koch 1926 [6410]

Juncion acutiflori Br.-Bl. in Br.-Bl. & Tüxen 1952 [6410]

*NARDETALIA STRICTAE* Rivas Goday in Rivas-Goday & Rivas-Martinez 1963

*NARDETEA STRICTAE* Rivas Goday in Rivas-Goday & Rivas-Martinez 1963

*Nardion strictae* Br.-Bl. 1926 [6150] only for the Alpine communities] [6230*] only for the Subalpine aspects of the association Sieversio-Nardetum strictae Lüdi 1948

*Violon caninae* Schwickerath 1944 [6230*]

Nardo-Agrostion tenuis Sillinger 1933 [6230*]

Ranunculo pillennis-Nardion strictae Bonin 1972 [6170] [6230*]

CALLUNO VULGARIS-ULICETEA MINORIS Br.-Bl. & Tüxen ex Klika & Hadač 1944 (= Nardo-Callunetea Oberdorfer 1979) elements of the class can originate mosaics with [5130]

*VACCINIO MYRTILLI-GENISTETALIA PILOSAE* R.Schub. 1960

*Genistion pilosae* Duvg. 1942 [4030]

*ULICETALIA MINORIS* Quantin 1935

*Cisto salviifolii-Ericion cinereae* Géhu 1975 [4030]

*CISTO LADAÑFERI-LAVANDULETEA STOECHADIS* Br.-Bl. in Br.-Bl., Molinier & Wagner 1940

*LAVANDULETALIA STOECHADIS* Br.-Bl. in Br.-Bl., Molinier & Wagner 1940 em. Rivas-Martínez 1968

*Anthyllion hermanniae* Klein 1972 [4090]

*Teucrion mari* Gamisans & Muracciole 1984 [2260] [4090] [5330] [5430]

*Calicotomo villosae-Genistion tyrhenae* Biondi (1997) 2000 [4090] [5330]

*Cistion ladaniferi* Br.-Bl. ex A. & O. Bolòs 1950 [2260]

*RUMICI-ASTGRALETAE SICULI* Pignatti & Nimis in E. Pignatti, Pignatti, Nimis & Avanzini 1980

*RUMICI-ASTGRALETALIA SICULI* Pignatti & Nimis in E. Pignatti, Pignatti, Nimis & Avanzini 1980

*Rumici actensis-Astragallon siculi* Poli 1965 [4090] [8320]

*CISTO CRETI-MICROMERIETEALIA JULIANAE* Oberdorfer 1954

*CISTO CRETI-ERICETALIA MANIPULIFLORAE* Horvatic 1958

*Cisto cretici-Ericion manipuliflorae* Horvatic 1958 (= Cytiso spinescentis-Saturejion montanae Pirone & Tammaro 1997 p.p.) [2260] [4090] [5110] [5420]

*SCROPHULARIO-HELICHRYSETEA* Brullo, Scelsi & Spampinato 1998

*SCROPHULARIO-HELICHRYSETALIA* Brullo 1984

*Euphorbion rigidae* Brullo & Spampinato 1990 [3250]

*Linariotum purpureae* Brullo 1984 [8130]


*ROSMARINETALIA OFFICINALIS* Br.-Bl. ex Molinier 1934

*Helianthemio italici-Aphyllanthion monspeliensis* Díez-Garretas, Fernández-González & Asensi 1998 (= Aphyllantion Br.-Bl. 1952) [2260]

*Rosmarinion officinalis* Br.-Bl. ex Molinier 1934 [2260]
Cisto eriocephali-Ericion multiflorae Biondi 2000 [2260] [5420]
Alyssion bertoloni Pignatti 1977 (incl. Euphorbion ligusticae Novak 1987) [4090] [5110]
Artemisio albae-Saturejion montanae Allegrezza, Biondi, Formica & Ballelli 1997 [3250]
ERYSIMO BONANNIANI-JURINETALIA BOCCONI Brullo 1983
Cerastio tomentosi-Astragalion nebrodensis Pignatti & Nimis in Pignatti, Pignatti, Nimis & Avanzini ex Brullo 1983 [4090]

CYTISETEA SCOPARIO-STRIATI Rivas-Martinez 1975
CYTISO VILLOSI-TELINETALIA MONSPESULANAE Rivas-Martinez, Galan & Cantò 2002
Telinion monspesulano-linifoliae Rivas-Martinez, Galan & Cantò 2002 [4030]

RHAMNO-PRUNETEA Rivas Goday & Borja ex Tüxen 1962 [elements of the class can be present in 8240*]
PRUNETALIA SPINOSAE Tüxen 1952
Pruno-Rubion ulmifolii O. Bolòs 1954 [2160] [2250*]
Berberidion Br.-Bl. 1950 [2250*] [4060] [5110] [5130]
Cytision sessilifolii Biondi in Biondi, Allegrezza & Guitian 1988 [5110] [5130]
Sarothamnion scoparri Tüxen ex Oberd. 1957 [4030]

ALNETEA GLUTINOSAE Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946
ALNETALIA GLUTINOSAE Tüxen 1937
Alnion glutinosae Malcuit 1929 [91E0*]

NERIO-TAMARICETEA Br.-Bl. & O. Bolòs 1957
Rubo-Nerion oleandri O. Bolòs 1985 [92D0]
Tamaricion africanae Br.-Bl & O. Bolòs 1958 [92D0]

Salicion incanae Aich. 1933 [3230] [3240]
Salicion albae Soó 1930 [91E0*] [92A0]
Salicion pedicellatae (Ubaldi 2003) Poldini, Vidali & Ganis 2011 [92A0]
POPULETALIA ALBAE Br.-Bl. ex Tchou 1948
Populion albae Br.-Bl. ex Tchou 1948 [5230*] [5310] [91B0] [91F0] [92A0]
Fraxinion angustifoliae Pedrotti ex Biondi & Casavecchia in Biondi, Casavecchia & Pesaresi 2010 [91B0] [91F0]
Alnion incanae Pawlowski in Pawlowski, Sokólski & Wallisch 1928 (= Alno-Ulmon Br.-Bl. & Tüxen 1943, Alno-Ulmon Br.-Bl. & Tüxen ex Tchou 1948 em. Müller & Görs 1958) [9160] [91E0*] [91F0]
Osmundo-Alnion glutinosae (Br.-Bl., P. Silva & Rozeira 1956) Dierschke & Rivas-Martínez in Rivas-Martínez 1975 [91E0*]
Alno-Quercion roboris Horvat 1950 [91F0] [92A0]
Platanion orientalis I. & V. Karpati 1961 [92C0]

ERICO-PINETEA Horvat 1959
ERICO-PINETALIA Horvat 1959
Erico-Pinion mugo Leibundgut 1948 nom. inv. [4070*] [9420] [9430*]
RHODODENDRO HIRSUTI-ERICETALIA CARNEAE Grabherr, Greimler & Mucina in Grabherr & Mucina 1993
Ericion carnea Rubel ex Grabherr, Greimler & Mucina 1993 [4060]

Juniperion thuriferae Rivas-Martínez 1969 [9560*]
Epipactido atropurpureae-Pinion mugo Stanisci 1997 [4070*]
Daphno oleoidis-Juniperion alpinae Stanisci 1997 [4060] [9430*] [9530*] [95A0]
JUNIPERETALIA HEMISPHAERICAE Rivas-Martín & J.A. Molina in Rivas-Martín, Fernández-González & Loidi 1999
Pruno prostratae-Juniperion sabinae Rivas-Martín & J.A. Molina in Rivas-Martín, Fernández-González & Loidi 1999 [9220*]
Berberidion aetnensis Brullo, Giusso & Guarino 2001 [9220*] [9510*] [9530*] [95A0]
Pinenion calabricae Brullo, Giusso & Guarino 2001 [9220*] [9510*] [9530*]

QUERCETEA ILICIS Br.-Bl. ex A. & O. Bolòs 1950
QUERCETALIA ILICIS Br.-Bl. ex Molinier 1934 em. Rivas-Martínez 1975
Fraxino orni-Quercion ilicis Biondi, Casavecchia & Gigante 2003 (incl. Erico-Quercion ilicis Brullo, Di Martino & Marcenò 1977) [5230*] [5310] [6310] [91AA*] [9250] [9320] [9330] [9340] [9350] [9380] [9540] [9580*]
Fraxino orni-Quercenion ilicis Bacchetta, Bagella, Biondi, Farris, Filigheddu & Mossa 2004 [5230*] [5310] [6310] [91AA*] [9250] [9320] [9330] [9340] [9350] [9380] [9540] [9580*]
Clematido cirrhosae-Quercenion ilicis Bacchetta, Bagella, Biondi, Farris, Filigheddu & Mossa 2004 [5230*] [5310] [6310] [91AA*] [9250] [9320] [9330] [9340] [9350] [9380] [9540] [9580*]
PISTACIO LENTISCI-RHAMNETALIA ALATERNI Rivas Martìnez 1975
Juniperion turbinatae Rivas-Martínez 1975 corr. 1987 [2250*] [2260] [2270*] [5210] [6310]

Oleo-Ceratonion siliquae Br.-Bl. ex Guinochet & Drouineau 1944 em. Rivas-Martínez 1975 [2270*] [5210] [5220*] [5330] [5420] [9320] [9540] [9580*]
Periplocion angustifoliae Rivas-Martínez 1975 [5220*] [5330]

Ericion arboreae (Rivas-Martínez ex Rivas-Martínez, Costa & Izco 1986) Rivas-Martínez 1987 [9330] [9540]
Pinion pineae Feinbrun 1959 [9540]

QUERCO-FAGETEA Br.-Bl. & Vlieger in Vlieger 1937 [elements of the class can be present in 8240*]
FAGETALIA SYLVATICAE Pawłowski in Pawłowski, Sokolowski & Wallisch 1928
Fagion sylvaticae Luquet 1926 [9130] [9140] [9150]

Cephalanthero-Fagenion Tüxen in Tüxen & Oberd. 1958 [9150]
Luzulo-Fagion sylvaticae Lohmeyer & Tüxen 1954 [9110] [9120] [9220*] for Luzulo pedemontanae-Fagetum sylvaticae Oberdorfer & Hofmann 1967 abietosum albae Arrigoni et al. 1998

Aremonio-Fagion sylvaticae (Horvat 1938) Török, Podani & Borhidi 1989 [91K0] [9210*] [9220*] [9510*] [9530*] [9580*]

Lamio orvalae-Fagenion Borhidi ex Marinček, Mucina, Zupančič, Poldini, Dakskobler & Accetto 1993 [91K0]

Ostryo carpinifoliae-Fagenion Borhidi 1963 [91K0]
Cardamino kitaibelii-Fagenion Biondi, Casavecchia, Pinzi, Allegrezza & Baldoni 2002 [9210*] [9220*]

Geranio versicoloris-Fagion sylvaticae Gentile 1970 [9210*] [9220*] [9380] [9510*] [9530*] [9580*]

Lamio flexuosi-Fagenion sylvaticae Gentile 1970 [9210*] [9220*] [9510*]

Carpinion betuli Issler 1931 [9160] [9170] [9260]
Erythronio dentis-canis-Carpinion betuli (Horvat 1958) Marinček in Wallnöfer, Mucina & Grass 1993 [91L0] [9260]

Pythospermo verticillati-Quercion cerris Biondi, Casavecchia & Biscotti 2008 [91L0]
Tilio platyphylli-Acerion pseudoplatani Klika 1955 [9180*]
Ostryo carpinifoliae-Tilienion platyphylli Kosir, Čarni & Di Pietro 2008 [9180*]

Lauro nobilis-Tilion platyphylli Biondi, Casavecchia & Biscotti 2008 [9180*]

QUERCELTA ROBORIS Tüxen 1931
Quercion roboris Malcuti 1929 [= Quercion robori-petraeae Br.-Bl. 1932 (syntax. syn.)] [9120] [9190] [9260]

Pino calabricae-Quercion congestae Brullo, Scelsi, Siracusa & Spampinato 1999 [91AA*] [9380] [9580*]
Paeonio morisii-Quercenion ichnusae Bacchetta, Biondi, Farris, Filigheddu & Mossa 2004 [9380]

Carpinion orientalis Horvat 1958 [5230*] [91H0*] [91AA*] [9250] [9260]
Cytiso sessilifolii-Quercenion pubescentis Ubaldi 1995 [91AA*]

Seslerio autumnalis-Ostryenion carpinifoliae Blasi, Di Pietro & Filesi 2004 [91H0*]

Ostryo-Carpinenion orientalis Poldini 1982 [91H0*]


Campanulo mediae-Ostryenion carpinifoliae Ubaldi 1995 [91AA*]

Teucrio siculi-Quercenion cerridis Ubaldi (1988) 1995 em. Scoppola & Filesi 1995 [91M0] [9260] [9330]

Teucrio siculi-Quercenion cerridis Blasi, Di Pietro & Filesi 2004 [91M0] [9260] [9330]

Ptilostemono stricti-Quercenion cerridis Bonin & Gamisan 1977 [91M0] [9260] [9330]

Tilio-Ostryon carpinifoliae Brullo, Scelsi & Spampinato 2001 [9180*]


VACCINIO-PICEETEA Br.-Bl. in Br.-Bl., Sissingh & Vlieger 1939

PICEETALIA ABIES Pawłowski in Pawłowski, Sokołowski & Walisch 1928 (= Vaccinio-Piceetalia Br.-Bl. in Br.-Bl. et al. 1939)

Betulion pubescentis Lohmeyer & Tüxen in Tüxen ex Oberd. 1957 [91D0*]

Piceion abietis Pawłowski in Pawłowski, Sokołowski & Wallisch 1928 [9410] [9420]

Calamagrostio variae-Abietion Horvat 1962 [9410]

Seslerio caeruleae-Pinion uncinatae Vigo 1974 [9430*]

VACCINIO-JUNIPERETALIA NANAE Rivas-Martínez & Costa 1998

Rhododendro-Vaccinion Br.-Bl. ex G. & J. Br.-Bl. 1931 [4060] [9430*]

Juniperion nanae Br.-Bl. in Br.-Bl., Sissingh & Vlieger 1939 [4060] [4070*] [9430*]


ASTRAGALO MONSPESSULANI-PINETALIA SYLVESTRIS Oberdorfer in Theurillat, Aeschimann, Küpfer & Spichiger 1995

Ononido-Pinion Br.-Bl. & Richard 1950 [9430*]

RHIZOCARPETEA GEOGRAPHICI Wirth 1972

ASPICILLETALIA GIBBOSAE Wirth 1972 em. Llimona & Egea 1987

Parmelion conspersae Hadaè 1944 [8230] [8320]

UMBILICARIETALIA CYLINDRICAE Wirth 1972

Umbilicariion cylindricae Gams 1927 [8230]

NECKERETEA COMPLANATAE Marst. 1986 (= Tortulo-Homalothecietea sericei Hertel 1974 p.p.) [elements of the class can be present in 8240*]

CLADONIO DIGITATAE-LEPIDOZIETEA REPTANTIS Ježek & Vondráček 1962 [elements of the class can be present in 8320]

CTENIDIEETEAE MOLLUSCI Hübschmann ex Grčić 1980 [elements of the class can be present in 8240*] [elements of the class can be present in 8320]

CAMPYLOPODETEA VAPORARII Brullo, Privitera & Puglisi ex Brullo, Privitera & Puglisi 2006 [elements of the class can be present in 8320]

GRIMMIETEA ALPESTRIS Hadač & Vondracek in Ježek & Vondráček 1962 [elements of the class can be present in 8320]

CERATODONTO PURPUREI-POLYTRICHETEA PILIFERI Mohan 1978 [elements of the class can be present in 8320]
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