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New and validated syntaxa for the checklist of Italian vegetation

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Abstract

We drew up a checklist of the Italian vegetation (<http://www.prodromo-vegetazione-italia.org/>), up to the syntaxonomical rank of alliance. During the compilation of this checklist, we observed that some syntaxa were invalidly published. For this reason, in this article we validated some syntaxa names and, at the same time, described new syntaxa of different hierarchical levels. Therefore, 10 new orders, 1 new suborder, 18 new alliances, 3 new suballiances and 5 new associations are described here. These new syntaxa belong to the following classes: *Adiantetetea capilli-veneris*, *Parietarietetea judaicae*, *Thlaspietetea rotundifolii*, *Artemisietetea vulgaris*, *Stellarietetea mediae*, *Galio aparines-Urticetetea dioicae*, *Mulgedio alpini-Aconitetetea variegati*, *Trifolio medii-Geramietetea sanguinei*, *Festuco-Seslerietetea*, *Salicetetea herbaceae*, *Festuco valesiacae-Brometetea erecti*, *Molinio-Arrhenatheretetea*, *Cisto cretici-Micromerietetea julianae*, *Rhamno catharticae-Prunetetea spinosae*, *Salici purpureae-Populetetea nigrae*, *Salicetetea purpureae*, *Quercetetea ilicis* and *Quercu roboris-Fagetetea sylvaticae*.

Keywords: *New syntaxa, Italy, phytosociology, syntaxonomy, validated syntaxa, vegetation checklist*

Introduction

The aim of this article is to describe some new syntaxa and thus improve the usefulness of the Italian Vegetation checklist (“Prodromo della Vegetazione d’Italia”: <http://www.prodromo-vegetazione-italia.org/>) in relation to the presentation of “EuroChecklist” (Mucina & the members of the EuroVegChecklist Team 2012). The previous publication of a preliminary article on the validation of some syntaxa helped to achieve this aim (Biondi et al. 2013). This contribution is focused on the validation of other syntaxa and on the description of new syntaxa.

Materials and methods

The study was conducted by using the phytosociological method (Rivas-Martínez 2005; Géhu 2006; Biondi 2011; Blasi et al. 2011; Blasi & Frondoni 2011; Pott 2011) adopting the International Code of Phytosociological Nomenclature (Weber et al. 2000).

As regards the taxonomic nomenclature, we examined the publications of Pignatti (1982) and Conti et al. (2005, 2007); the following websites were also consulted: <http://www.anarchive.it> and <http://www.theplantlist.org>.

With regard to the syntaxa definitions discussed here that are part of the syntaxonomic adjustment, the following contributions and websites were examined: Bardat et al. (2004), Rivas-Martínez et al. (2011), Mucina et al. (1993), Oberdorfer (1992), Pott (1995) and Chytrý (2007, 2009, 2011).

The general framework used for the description of new syntaxa and for the validation of other syntaxa is the same as that adopted for the “Prodromo della vegetazione d’Italia” (Biondi & Blasi 2013).

The new syntaxonomical proposals and the validated syntaxa are presented as follows: each syntaxon is attributed to a class and to the lower levels numbered according to the prodrome (<http://www.prodromo-vegetazione-italia.org/>).

Description of new and validated syntaxa

29 Cl.: *ADIANTETEA CAPILLI-VENERIS* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952

29.1 Ord.: *ADIANTETALIA CAPILLI-VENERIS* Br.-Bl. ex Horvatić 1939

All. Polysticho setiferi-Phyllitidion scolopendri
Ubaldi ex Ubaldi & Biondi all. nova hoc loco

Validated name: *Polysticho setiferi-Phyllitidion scolopendri* Ubaldi 2011 *nom. inval.* (art. 5) (Ubaldi 2011).

Holotypus: *Conocephalo-Woodwardietum radicans* Brullo, Lo Giudice & Privitera 1989 (Brullo et al. 1989: rel. 3, tab. 6).

Diagnostic taxa: *Asplenium scolopendrium* L. [= *Phyllitis scolopendrium* (L.) Newman], *Polystichum setiferum* (Forssk.) T. Moore ex Woyn., *Dryopteris affinis* (Lowe) Fraser-Jenk., *Anthyrium filix-foemina* (L.) Roth.

Short description: rocky plant community, dominated by big ferns, rich in mosses and lichens, which grows on rocky or earthy walls, in habitats characterised by high edaphic humidity, in narrow and shadowy gorges. It is mainly distributed in the Mediterranean macrobioclimate and occasionally in the Submediterranean variant of the Temperate macrobioclimate. In Italy, it has been observed in the south and in the largest islands as well as in coastal and sub-coastal areas in the central-northern part of the country.

31 Cl.: *ARIETARIETEA JUDAICAE* Oberdorfer 1977

Ord.: CAPPARIDETALIA SPINOSAE Biondi, Blasi & Galdenzi *ord. novo hoc loco*

Holotypus: *Artemisio arborescentis-Capparidion spinosae* Biondi, Blasi & Galdenzi *all. nova*

Diagnostic taxa: *Capparis spinosa* L. var. *inermis* Turra [= *C. orientalis* Veill., *C. rupestris* Sm., *C. spinosa* L. subsp. *rupestris* (Sm.) Nyman], *Artemisia arborescens* (Vaill.) L., *Ficus carica* L. [= *F. caprificus* Risso], *Nicotiana glauca* Graham.

Short description: Mediterranean and thermo-Atlantic thermophilous shrubby communities that colonise rocky walls and cliffs.

Further comments: it is necessary to group the *Capparis spinosa* Mediterranean vegetation, which is characterised by a high presence of other shrubby species that grow on walls and rocky slopes, in a new order because the structure of this vegetation is clearly distinct from that of the *Tortulo-Cymbalariaetalia* Segal 1969 order, which is instead mainly made up of perennial herbaceous species. It is possible to relate this structural diversity to the ecological distribution of the plant communities belonging to the new order that is strongly linked to

the Mediterranean macrobioclimate and mainly to the inframediterranean, thermomediterranean thermotypes with the semiarid to arid Ombric types. By contrast, the order *Tortulo-Cymbalariaetalia* Segal 1969 is spread throughout the Temperate macrobioclimate, though it is also found in the Mediterranean macrobioclimate, particularly in the mesomediterranean and occasionally in the thermomediterranean thermotypes, though only in habitats characterised by a high degree of humidity.

All.: *Artemisio arborescentis-Capparidion spinosae* Biondi, Blasi & Galdenzi *all. nova hoc loco*

Holotypus: *Artemisio arborescentis-Capparidion inermis* Biondi, Blasi, Brugiapaglia, Fogu, Mossa & Galdenzi *ass. nova*

Diagnostic taxa: the same of the order.

Short description: thermo-Mediterranean alliance that comprises shrubby communities growing on walls and rocky slopes, in the inframediterranean and thermomediterranean thermotypes (dry to arid Ombric type) within the Mediterranean macrobioclimate.

Ass.: *Artemisio arborescentis-Capparidion inermis* Biondi, Blasi, Brugiapaglia, Fogu, Mossa & Galdenzi *ass. nova hoc loco*

Corresponding name: *Capparidion inermis* O. de Bolòs & R. Moliniere 1958 *artemisietosum arborescentis* Biondi, Blasi, Brugiapaglia, Fogu & Mossa 1994 (Biondi et al. 1994: rel. 1–3, tab. 15).

Holotypus: rel. 2, tab. 15 in Biondi et al. (1994).

Diagnostic taxa: *Capparis spinosa* L. var. *inermis* Turra [= *C. orientalis* Veill., *C. rupestris* Sm., *C. spinosa* L. subsp. *rupestris* (Sm.) Nyman], *Artemisia arborescens* (Vaill.) L.

Short description: perennial community dominated by shrubby species with *Capparis spinosa* and *Artemisia arborescens*.

33 Cl.: *THLASPIETEA ROTUNDIFOLII* Braun-Blanq. 1948

Ord.: *THLASPIETALIA STYLOSI* Avena & Bruno 1975

All: *Violo magellensis-Cerastium thomasii* Biondi, Blasi & Allegrezza *all. nova hoc loco*

[*Syn.:* *Crepido breviscapi-Violion magellensis* Ubaldi 2011 *nom. inval.* (art. 5)]

Holotypus: *Arabido alpinae-Cerastietum thomasii* Biondi, Allegrezza, Ballelli & Taffetani 2000 (Biondi et al. 2000: rel. 1, tab. 6).

Diagnostic taxa: *Cerastium thomasii* Ten., *Arabis alpina* L., *Draba aspera* Bertol., *Festuca alfrediana* Foggi et Signorini.

Short description: vegetation of carbonate screes that occurs at the highest altitudes of the central-southern Apennines and is typical of the criotemperate thermotype.

All: Aquilegion bertolonii (Tomaselli 1994) Biondi & Allegrezza stat. nov. hoc loco

Corresponding name: Aquilegion bertolonii Tomaselli 1994 (Tomaselli 1994: 41)

Holotypus: Herachleo-Valerianetum montanae Tomaselli 1988 (Tomaselli 1988: rel. 2, tab. 4).

Diagnostic taxa: Aquilegia bertolonii Schott, Galium palaeoitalicum Ehrend., Pimpinella tragium Vill. subsp. lithophila (Schischk.) Tutin.

Short description: vegetation of carbonate screes in the Apuan Alps that occurs in the supratemperate thermotype.

34 Cl.: ARTEMISIETEA VULGARIS Lohmeyer, Preising & Tüxen ex Von Rochow 1951

Ord.: PODOSPERMO LACINIATI-ELYTRIGETALIA ATHERICAE Biondi, Allegrezza & Pesaresi ord. novo hoc loco

Holotypus: Podospermo laciniati-Elytrigion athericae Pirone 1995 [Syn.: Podospermo laciniati-Elytrigion athericae (Pirone 1995) Biondi & Pesaresi 2004 (Pirone 1995: 225; Biondi & Pesaresi 2004: 161)].

Diagnostic taxa: Artemisia caerulescens L. subsp. cretacea (Fiori) Brilli-Catt. & Gubellini, Artemisia caerulescens L. subsp. caerulescens, Scorzonera cana (C.A. Mey.) O. Hoffm., Elytrigia atherica (Link) Kerguelen, Podospermum laciniatum (L.) DC., Plantago maritima L.

Short description: Pioneer paucispecific hemicyptophytic and chamaephytic halophilous-to-halotolerant plant communities of badlands. They mainly occur in the temperate macrobioclimate Submediterranean variant from lower supratemperate to lower mesotemperate thermotypes, and in the upper mesomediterranean thermotypic horizon of the Mediterranean macrobioclimate. This order occurs in the northern-central Italian badlands, extending as far south as the Molise region.

Further comments: this new order highlights the floristic and ecological autonomy of subhalophilous argillaceous and argillaceous–pelitic badlands affected by rapid soil erosion.

39 Cl.: STELLARIETEA MEDIAE Tüxen, Lohmeyer & Preising ex Von Rochow 1951

39b Subcl.: CHENOPODIO-STELLARIENEA Rivas Goday 1956

Ord.: URTICO-SCROPHULARIETALIA PEREGRINAE Brullo ex Biondi, Blasi, Casavecchia & Gasparri ord. novo hoc loco

Validated name: Urtico-Scrophularietalia peregrinae Brullo in Brullo & Marcenò 1985 nom. inval. (art. 17).

Lectotypus: Veronico-Urticion urentis Brullo in Brullo & Marcenò 1985 (Brullo & Marcenò 1985: 50).

Diagnostic taxa: Galium aparine L., Urtica membranacea Poir. ex Savigny, Parietaria judaica L., Fumaria capreolata L., Scrophularia peregrina L.

Short description: ephemeral nitrophilous vegetation of tall therophytes and geophytes that grow on humid and deep soils, in shadowy habitats, in thermomediterranean and mesomediterranean thermotypes.

40 Cl.: GALIO APARINES-URTICETEA DIOICAE Passarge ex Kopecký 1969

40.1 Ord.: GALIO APARINES-ALLIARIETALIA PETIOLATAE Oberdorfer ex Görs & Müller 1969

All: Parietario judaicae-Arion italicum Biondi, Casavecchia & Gasparri all. nova hoc loco

Holotypus: Parietario judaicae-Aretum italicum Biondi, Casavecchia & Gasparri ass. nova hoc loco

Diagnostic taxa: Arum italicum Miller, Urtica dioica L., Symphytum tuberosum L., Allium neapolitanum Cyr., Parietaria judaica L.

Short description: perennial herbaceous edge communities dominated by mesophilous and sciaphilous geophytes and hemicyptophytes. They grow on deep and humid soils that are rich in organic matter, owing to their prevalently anthropogenic origin, in the Mediterranean macrobioclimate, particularly in the thermo- to mesomediterranean thermotypes, while their optimum in the Temperate macrobioclimate is found in the Submediterranean variant of the mesotemperate thermotype.

Ass.: Parietario judaicae-Aretum italicum Biondi, Casavecchia & Gasparri ass. nova hoc loco

Holotypus: rel. 1 in Table I in this article.

Diagnostic taxa: Arum italicum Miller, Parietaria judaica L., Allium neapolitanum Cyr.

43 Cl.: MULGEDIO ALPINI-ACONITETEA VARIEGATI Hadač & Klika in Klika & Hadač 1944

43.1 Ord.: ADENOSTYLETALIA ALLIARIAE Br.-Bl. 1931

Table I. *Parietario judaicae-Aretum italicum* Biondi, Casavecchia & Gasparri ass. nova (*holotypus*: rel. 1).

No. of relevé	1*	2	3	4	5	6	Pres.
Exp.	SE	WNW	W	-	-	SSW	
Slope (°)	50	15	20	-	-	25	
Surface (m ²)	20	60	30	50	15	60	
Coverage (%)	100	100	100	100	100	100	
Charact. species of the ass.							
Arum italicum Miller	4.5	4.5	2.3	4.4	5.5	5.5	6
Parietaria judaica L.	2.2	1.2	1.2	3.3	2.3	3.4	6
Allium neapolitanum Cyr.	1.2	3.4	3.3	.	.	.	3
Charact. species of the upper units							
Galium aparine L.	3.3	+2	.	.	+	.	3
Lamium maculatum L.	+	+	.	.	.	.	2
Urtica dioica L.	1.2	.	.	1.2	.	.	2
Silene vulgaris (Moench) Garcke	+2	.	.	.	.	.	1
Other species							
Rubus ulmifolius Schott	+2	+	.	1.2	+	1.2	5
Theligonum cynocrambe L.	.	2.3	1.2	.	.	1.2	3
Rubia peregrina L.	.	+	.	.	+	1.2	3
Mercurialis annua L.	2.2	.	.	+	.	.	2
Sinapis alba L.	.	+	.	+	.	.	2
Asparagus acutifolius L.	.	+	.	.	+	.	2
Clematis vitalba L.	.	.	.	+	+	.	2
Sambucus nigra L.	2.2	.	.	.	.	.	1
Brachypodium sylvaticum (Hudson) Beauv.	1.2	.	.	.	.	.	1
Ulmus minor Miller	+2	.	.	.	.	.	1
Quercus pubescens Willd.(pl)	+2	.	.	.	.	.	1
Cornus sanguinea L.	+	.	.	.	.	.	1
Oryzopsis miliacea (L.) Asch. et Sch. ssp. thomasi (Duby) Pign.	.	1.2	.	.	.	.	1
Hedera helix L.	.	+	.	.	.	.	1
Arisarum vulgare Targ.-Tozz.	.	.	3.4	.	.	.	1
Sambucus nigra L. pl.	.	.	.	+	.	.	1

Note: Rel. 1: Recanati, 03.02.2013; Rel. 2: Polverigi, 07.12.2012; rel. 3: Ancona, 09.01.2014; Rel. 4: Marcelli di Numana, 04.01.2003; Rel. 5: Numana, 04.01.2003; rel. 6: Selva di Gallignano, 28.11.2012.

Subord. ADENOSTYLENALIA ALPINAЕ Biondi & Allegrezza *subord. novo hoc loco*

Holotypus: *Adenostylion alpinae* Castelli et al. ex Castelli, Biondi & Ballelli all. nova *hoc loco*

Diagnostic taxa: *Adenostyles alpina* (L.) Bluff et Fingerh. [= *A. glabra* (Mill.) DC.].

Short description: communities of megaforbs that are characteristic of the supratemperate thermotype of the Apennines and part of the Balkan Peninsula. This new suborder is the geographic vicariance of the alpine vegetation dominated by *Adenostyles alliaria*.

All.: *Adenostylion alpinae* Castelli et al. ex Castelli, Biondi & Ballelli all. nova *hoc loco*

Validated name: *Adenostylion glabrae* Castelli, Biondi & Ballelli 2001 *nom. inval.* (art. 2b, 8).

Holotypus: *Valeriano tripteris-Adenostyletum glabrae* Castelli, Biondi & Ballelli 2001 (Castelli et al. 2001: rel. 54, tab. 8).

Diagnostic taxa: *Valeriana tripteris* L., *Adenostyles alpina* (L.) Bluff et Fingerh. [= *A. glabra* (Mill.) DC.], *Hieracium murorum* L. [= *H. sylvaticum* (L.) L.].

Short description: communities of megaforbs that grow in the supratemperate thermotype of the Apennines, on constantly humid, rocky-earthly, north-facing, mountainsides.

All.: *Aconitum neapolitani* Biondi & Allegrezza all. nova *hoc loco*

Holotypus: *Ranunculo lanuginosi-Aconitetum neapolitani* Allegrezza 2003 (Allegrezza 2003: rel. 3, tab. 43).

Diagnostic taxa: *Aconitum lycoctonum* L. emend. Koelle subsp. *neapolitanum* (Ten.) Nyman, *Geranium nodosum* L., *Cardamine kitaibelii* Bech., *Ranunculus lanuginosus* L.

Short description: communities of megaforbs dominated by *Aconitum lycoctonum* subsp. *neapolitanum* that grow in the supratemperate thermotype of the Apennines. They develop on deep, humid soils in shallow lands, at the edges of beech woods and maple woods.

44 Cl.: TRIFOLIO MEDII-GERANIETEA SANGUINEI Müller 1962

44.1 Ord.: ORIGANETALIA VULGARIS Müller 1962

All.: Digitali australis-Helleborion bocconei Biondi, Vagge & Galdenzi *all. nova* hoc loco

Holotypus: Digitali micranthae-Helleboretum bocconei Biondi, Carni, Vagge, Taffetani & Ballelli 2001 (Biondi et al. 2001: rel. 39, tab. 2).

Diagnostic taxa: Digitalis lutea subsp. australis (Ten.) Arcang., Helleborus bocconei Ten. subsp. bocconei, Veratrum nigrum L.

Short description: communities of the pre-forestal mesophilous edges of the central-southern Apennine calcareous mountains, where it replaces the alliance Trifolium medii Müller 1962, which is more continental and occurs further north. It can be observed from the upper mesotemperate to the upper supratemperate thermotypic horizon.

All.: Geranio nodosi-Digitalion luteae Biondi, Vagge & Galdenzi *all. nova* hoc loco

Holotypus: Helleboro odori-Geranium nodosi Vagge & Biondi 2004 (Vagge & Biondi 2004: rel. 17, tab. 3).

Diagnostic taxa: Digitalis lutea L subsp. lutea, Helleborus odoratus W. et K., Geranium nodosum L., Gentiana aclepiadea L., Luzula nivea (L.) Lam. et DC.

Short description: communities of the pre-forest mesophilous edges that occur in the central-northern Apennine mountains, on the Tyrrhenian side, and on marly arenaceous and Flysch substrates. Within the Temperate macrobioclimate, Submediterranean variant; and meso- and supratemperate thermotypes, it replaces the alliance Digitali micranthae-Helleboreum bocconei on acid soils.

Ord.: ASPHODELETALIA MACROCARPAE Biondi & Allegranza *ord. novo* hoc loco

Holotypus: Cyano triumfetti-Asphodelion macrocarpi Biondi & Allegranza *all. nova* hoc loco

Diagnostic taxa: Cyanus triumfetti (All.) Dostál ex Á. & D. Löve, Asphodelus macrocarpus Parl., Filipendula vulgaris Moench, Brachypodium genuense (DC.) Roem. & Schult., B. rupestre (Host) R. et S., Knautia purpurea (Vill.) Borbás, Centaurea ambigua Guss., Leontodon cichoraceus (Ten.) Sanguin. [Scorzoneroideis cichoracea (Ten.) Greuter in Zidorn 2012], Trifolium ochroleucum Huds., Senecio scopolii Hoppe et Hornsch., Campanula micrantha Bertol.

Short description: herbaceous vegetation dominated by geophytes and tall hemicryptophytes, which forms a heliophilous edge and is in contact with forest sciaphilous edges (Origanetalia vulgaris order). These communities colonise, through dynamic invasion, abandoned secondary grasslands in the meso- and supratemperate thermotypes.

All.: Cyano triumfetti-Asphodelion macrocarpi Biondi & Allegranza *all. nova* hoc loco

Holotypus: Senecio scopolii-Asphodeletum macrocarpi Biondi & Allegranza *ass. nova* hoc loco

Diagnostic taxa: the same of the order.

Short description: communities of heliophilous subacidophilous herbaceous edges, dominated by Asphodelus macrocarpus and Brachypodium genuense, which colonise completely abandoned or barely used secondary grasslands, on deep oligotrophic soils. They can be found from the upper mesotemperate to the upper supratemperate thermotypic horizon of the Apennines.

Ass.: Senecio scopolii-Asphodeletum macrocarpi Biondi & Allegranza *ass. nova* hoc loco

Holotypus: rel. 8 in Table II in this article.

Diagnostic taxa: Asphodelus macrocarpus Parl. subsp. macrocarpus, Senecio scopolii Hoppe et Hornsch. subsp. floccosus (Bertol.) Greuter, Brachypodium genuense (DC.) Roem. & Schult., Viola eugeniae Parl.

Further comments: this new order is designed to conceptually represent the ecotonal space that occurs between the wood and the grassland, where the dynamic recovery of serial vegetation starts separating the heliophilous edge from the wood. The order groups together communities of megaforbs comprising typologies that have been often confused with others that are typical of grasslands and that display a clear combination, thus representing different levels of the same serial succession on secondary grasslands abandoned by agricultural-pasture activities.

44.3 Ord.: MELAMPYRO PRATENSIS-HOLCETALIA MOLLIS Passarge 1979

All.: Digitali ferrugineae-Pteridion aquilini Biondi & Casavecchia *all. nova* hoc loco

Holotypus: Digitali ferrugineae-Pteridietum aquilini Biondi, Biscotti & Casavecchia *ass. nova* hoc loco

Diagnostic taxa: Digitalis ferruginea L., Origanum heracleoticum L., Teucrium siculum Rafin., Potentilla hirta L.

Short description: communities of mesophilous forest edges that are dominated by Pteridium aquilinum of the mesotemperate bioclimatic belt, as well as in the sub-Mediterranean variant. In the Apennines, the order replaces the alliance Holco mollis-Pteridion aquilini Passarge (1994) 2002.

Charact. and diff. species of the class *Rhamno-Prunetea*

Rubus canescens DC.	2.2	2.2	2.3	2.3	+	+	2.3	2.2	8
Erica arborea L.	+	.	+	.	.	+	1.1	2.3	5
Cytisus scoparius (L.) Link	.	+	.	.	.	+	3.4	2.3	4
Crataegus monogyna Jacq.	.	.	.	.	.	.	2.2	2.2	3
Pyrus amygdaliformis Vill.	.	.	.	.	1.2	.	+	2.2	3
Rosa canina L. sensu Bouleng.	.	+	.	.	.	+.2	.	.	2
Cytisus villosus Pourret	.	+	.	.	.	.	.	1.2	2
Prunus spinosa L.	.	.	.	.	.	+	.	.	2
Lonicera etrusca Santi	.	.	.	.	.	+	1.2	.	2
Genista tinctoria L.	.	.	.	.	3.3	.	.	.	1
Rosa arvensis Hudson	.	.	.	.	1.2	.	.	.	1
Clematis vitalba L.	.	.	.	.	.	.	1.2	.	1
Malus sylvestris Miller	.	.	.	.	.	.	+	.	1
Other species									
Dactylis glomerata L.	1.1	+	1.1	+	.	1.2	1.1	+	7
Picris hieracioides L.	+	1.1	1.1	+	.	.	.	.	4
Inula viscosa (L.) Aiton	1.1	.	+	1.1	.	.	.	.	3
Daucus carota L.	1.1	.	+	.	.	.	.	+	3
Dorycnium pentaphyllum Scop. ssp. herbaceum (Vill.) Rouy	.	1.2	2.2	.	.	.	+	.	3
Centaurium erythraea Rafn	+	.	+	.	.	.	.	.	2
Anthemis tinctoria L.	.	+	+	.	.	.	.	.	2
Carlina corymbosa L.	.	+	+	+	.	.	.	.	2
Pinus halepensis Miller pl.	.	.	1.1	+	.	.	.	.	2
Potentilla reptans L.	.	.	+	.	1.2	.	.	.	2
Sanguisorba minor Scop. ssp. minor	.	.	+	.	.	+	.	.	2
Agrostis stolonifera L.	.	.	.	1.2	.	.	+.2	.	2
Anthoxanthum odoratum L.	.	.	.	.	.	+	.	1.2	2
No. of accidental species	0	0	3	0	5	4	0	1	

Note: Rel. 1: Forchione, near Vico del Gargano, 29.07.2004; Rel. 2: Poggio, between France and Coppa Schiava (Gargano), 29.07.2004; Rel. 3: San Morlicchio (Gargano), 25.07.2005, *Clematis flammula* 2.2, *Trifolium pratense* 1.2, *Quercus ilex* pl. 1.1; Rel. 4: between Cerrogrosso and Limitoni (Gargano), 29.07.2004; Rel. 5: Masseria di Maratea (Vico del Gargano), 09.11.2006, *Puhonaria apennina* 2.2, *Daphne laureola* 1.2, *Cyclamen hederifolium*, *Viola reichenbachiana* 1.2, *Euphorbia amygdaloides* 1.2; Rel. 6: Foresta Umbra (Gargano), 26.07.2004, *Viola odorata* 2.2, *Achillea ligustica* 1.1, *Asphodeline liburnica* 1.2, *Asphodelus microcarpus* 1.1; Rel. 7: Limitoni (Vico del Gargano), 12.07.2003; Rel. 8: Gambadoro (Gargano), 25.07.2005, *Cistus creticus* 2.3.

49.2.1 All.: *Arabidion caeruleae* Br.-Bl. in Br.-Bl. & Jenny 1926

Suball.: Carici kitaibelianae-Salicenion retusae Biondi & Allegrezza *suball. nova hoc loco*

Holotypus: Carici kitaibelianae-Salicetum retusae Biondi, Ballelli, Allegrezza, Taffetani, Frattaroli, Guitian & Zuccarello 1999 (Biondi et al. 1999: rel. 1, tab. 11).

Diagnostic taxa: *Salix retusa* L., *Carex kitaibeliana* Degen ex Bech., *Trifolium noricum* Wulfen subsp. *praetutianum* (Guss.) Pignatti.

Short description: neutro-basiphilous communities found in the high mountains of the calcareous central Apennines.

51 Cl.: *FESTUCO VALESIIACAE-BROMETEA ERECTI* Br.-Bl. & Tüxen ex Br.-Bl. 1949

Ord.: PHLEO AMBIGUI-BROMETALIA ERECTI Biondi, Allegrezza, Blasi & Galdenzi *ord. novo hoc loco*

Holotypus: *Phleo ambiguï-Bromion erecti* Biondi, Ballelli, Allegrezza & Zuccarello ex Biondi & Galdenzi 2012 (Biondi & Galdenzi 2012: 106).

Diagnostic taxa: *Avenula praetutiana* (Parl. ex Arcang.) Pignatti, *Carex macrolepis* DC., *Centaurea ambigua* Guss., *Chamaecytisus spinescens* (Presl) Rothm., *Erysimum pseudorhaeticum* Polatschek, *Festuca circummediterranea* Patzke, *Globularia meridionalis* (Podp.) O. Schwarz, *Onosma echioides* L., *Phleum hirsutum* Honck. subsp. *ambiguum* (Ten.) Tzvelev, *Polygala major* Jacq., *Sesleria nitida* Ten., *Thymus striatus* Vahl, *Trifolium montanum* L., *Trinia dalechampii* (Ten.) Janchen.

Short description: the order includes xerophilous and semi-mesophilous secondary grasslands, found from the supramediterranean to the mesotemperate thermotypes, with the optimum occurring in the mesotemperate bioclimatic belt, frequently even in the submediterranean variant of the Temperate macrobioclimate. It replaces the order *Scorzonero-Chrysopogonetalia*, purely Illyrian, in the central-southern Apennines (with the exception of Calabria).

Further comments: a description of this new syntaxon is required in order to group together communities whose floristic and phytogeographic autonomy is due to a large number of endemic taxa typical of secondary Apennine grasslands, and distinguish them from similar conenoses of the order *Scorzonero-Chrysopogonetalia*.

56 Cl.: *MOLINIO-ARRHENATHERETEA* Tüxen 1937

56.4 *Ord.*: *HOLOSCHOENETALIA VULGARIS* Br.-Bl. ex Tchou 1948

All.: *Agrostion montelucci* Biondi *all. nova hoc loco*

Holotypus: *Oenanthe pimpinelloidis-Agrostietum montelucci* Biondi, Brugiapaglia & Tedeschini Lalli 1998 (Biondi et al. 1998: rel. 1, tab. 2).

Diagnostic taxon: *Agrostis montelucci* (Selvi) Banfi.

Short description: paucispecific communities of hemicyptophytes that form thick grasslands, dominated by *Agrostis montelucci*, an endemic species that colonises marshes rich in calcium carbonate, carbon dioxide and hydrogen sulphide (acque albule). This syntaxon occurs in the central-southern Tyrrhenian part of Italy, in areas that contain springs linked to secondary volcanism, extending from the sea level to the lower supratemperate bioclimatic belt.

Further comments: these grasslands are extraordinary habitats that colonise extreme environments (e.g. Biondi et al. 1998; Capotorti et al. 2013), as highlighted in some articles on the eco-physiology of dominant species (Fordham et al. 1997; Gallagher et al. 2010).

Ord. SACCHARETALIA RAVENNAE Biondi, Blasi & Casavecchia *ord. nov. hoc loco*

Holotypus: *Imperato cylindricae-Erianthion ravennae* Br.-Bl. & O. Bolòs 1958 (Braun-Blanquet & Bolòs 1958: 199).

[Syn.: *Imperato cylindricae-Saccharion ravennae* Br.-Bl. & O. Bolòs 1958 *nom. mut. propos.* Rivas-Martínez, Diaz, Fernández-González, Izco, Loidi, Lousa & Penas 2002]

Ass. typus: *Equiseto ramosissimae-Erianthetum ravennae* Br.-Bl. et O. Bolòs 1958 (*Lectotypus* rel. 4, tab. 41 in Braun-Blanquet & Bolòs 1958).

Diagnostic taxa: *Saccharum ravennae* (L.) Murray [= *Erianthus ravennae* (L.) P. Beauv., *Tripidium ravennae* (L.) H. Scholz], *Arundo plinii* Turra, *Imperata cylindrica* (L.) Raeusch.

Short description: vegetation of perennial hemicyptophytes, dominated by *Saccharum ravennae*, of freshwater that is occasionally slightly halophylous, temporarily flooded, on sandy and sandy-silty substrates of retrodunal areas and of estuaries. It often represents the ecological union between the vegetation of freshwater marshes of the order *Phragmitetalia australis* and the halophylous communities of the class *Juncetea maritima*.

Further comments: the distribution range of this new order includes the Mediterranean coasts of the Iberian Peninsula, the coasts of northern Africa as far as Tunisia, the French and Italian coasts, as well as the Balkan and Aegean coasts. This order has one alliance in Italy, *Imperato cylindricae-Saccharion ravennae*, which has been described in the lowland of the river Ebre (Braun-Blanquet & Bolòs 1958) and has been attributed to the class *Nerio-Tamaricetea*;

this classification is nowadays followed by several authors (Rivas-Martínez et al. 2002, 2011), though it has been questioned by Izco et al. (1984).

61 Cl.: *CISTO CRETICI-MICROMERIETEA JULIANAE* Oberdorfer ex Horvatic 1958

Ord.: *Artemisio albae-Saturejietalia montanae* (Allegrezza, Biondi, Formica & Ballelli 1997) Biondi & Allegrezza *ord. nov.* hoc loco

Holotypus: *Artemisio albae-Saturejion montanae* Allegrezza, Biondi, Formica & Ballelli 1997 (Allegrezza et al. 1997: 93).

Diagnostic taxa: *Satureja montana* L., *Artemisia alba* Turra, *Cephalaria leucantha* (L.) Roem. & Shult., *Alyssoides utriculata* (L.) Medik., *Asphodeline lutea* (L.) Rchb., *Helianthemum oelandicum* (L.) Dum. Cours., *Ruta graveolens* L., *Silene otites* (L.) Wibel, *Centaurea rupestris* L., *Pimpinella saxifraga* L., *Euphorbia spinosa* L., *Globularia meridionalis* (Podp.) O. Schwarz, *Globularia bisnagarica* L., *Thymus longicaulis* C. Presl, *Asperula purpurea* (L.) Ehrend., *Inula montana* L.

Short description: it groups together chamaephytic and nanophanaerophytic calcicolous rocky and pioneer vegetation, which occurs in the Temperate macrobioclimate, from the mesotemperate to the supratemperate thermotypes even in the Submediterranean variant. It is typical of Apennine heights, though it is also found in the Alps and in the Balkan Peninsula. It is the geographic vicarious of the order *Ononidetalia striatae*, which is distributed in south-western Europe.

64 Cl.: *RHAMNO CATHARTICAE-PRUNETEA SPINOSAE* Rivas Goday & Borja ex Tüxen 1962

Ord.: *LAURO NOBILIS-SAMBUCETALIA NIGRAE* Biondi, Blasi, Casavecchia, Galdenzi & Gasparri *ord. novo* hoc loco

Holotypus: *Lauro nobilis-Sambucion nigrae* Biondi, Blasi, Casavecchia, Galdenzi & Gasparri *all. nova hoc loco*

Diagnostic taxa: *Sambucus nigra* L., *Laurus nobilis* L., *Rubus ulmifolius* Schott, *Rhamnus alaternus* L., *Rubia peregrina* L., *Ulmus minor* Miller, *Hedera helix* L.

Short description: nitrophilous micro-forests characterised by *Sambucus nigra* and Mediterranean species that occur in wet and shady areas, on soils rich in organic matter, in the Mediterranean macrobioclimate, mesomediterranean thermotype, occasionally also in the upper thermomediterranean thermotypic horizon; it also occurs in the Temperate

macrobioclimate, particularly in the Submediterranean variant.

Further comments: the *Sambucus nigra* vegetation occurs throughout Europe, from central European to Mediterranean regions, in different bioclimatic belts and, consequently, in different ecological conditions and biogeographic areas.

The order *Prunetalia spinosae* is distributed prevalently in northern regions, whereas in the Mediterranean region it is found almost exclusively close to the rivers or in areas characterised by a high groundwater table. The new order partially replaces *Prunetalia spinosae* because it occurs above all in southern European areas, in the Mediterranean and Temperate (particularly Submediterranean variant) macrobioclimates. In these conditions, the vegetation is enriched by different phytogeographic elements: species with northern distribution, owing to the edaphic humidity, and Mediterranean and thermo-Mediterranean species.

All.: *Lauro nobilis-Sambucion nigrae* Biondi, Casavecchia, Galdenzi & Gasparri *all. nova* hoc loco

Holotypus: *Symphyto bulbosi-Sambucetum nigrae* Biondi & Allegrezza 2004 (Biondi & Allegrezza 2004: rel. 1, tab. 7).

Diagnostic taxa: the same of the order.

Short description: the same of the order.

Ord.: *PYRO SPINOSAE-RUBETALIA ULMIFOLII* Biondi, Blasi & Casavecchia *ord. novo* hoc loco

Holotypus: *Pruno spinosae-Rubion ulmifolii* O. Bolòs 1954

Diagnostic taxa: *Pyrus spinosa* Forssk. [= *P. amygdaliformis* Vill.], *Rubus ulmifolius* Schott, *Lonicera etrusca* Santi, *Rosa sempervirens* L.

Short description: it groups together the shrub communities occurring on deep and wet soils rich in clay or pelites, within the humid mesomediterranean or submediterranean bioclimate.

Further comments: as the *Pruno-Rubion*, based on the presence of Mediterranean and sub-Mediterranean syntaxa and dominated by *Rubus ulmifolius*, occurs in a wide range of chorologic areas and climates, we believe the rank of this alliance should be raised to order (e.g. Blasi et al. 1999, 2000, 2002; Biondi, Bagella, et al. 2002; Biondi, Farris, et al. 2002; Poldini, Vidali, Biondi, et al. 2002; Poldini, Vidali, & Zanatta 2002).

All. *Arundo plinii-Rubion ulmifolii* Biondi, Blasi, Casavecchia & Gasparri *all. nova* hoc loco

Holotypus: *Arundo plinii-Rubetum ulmifolii* Biondi, Casavecchia & Gasparri *ass. nova hoc loco*

Diagnostic taxa: *Arundo plinii* Turra, *A. donax* L., *Phragmites australis* (Cav.) Trin., *Rubus ulmifolius* Schott, *Urtica dioica* L., *Rubia peregrina* L.

Short description: the alliance groups together the communities dominated by *Rubus ulmifolius*, which occur on various types of soils with varying degrees of water retention: clay, pelitic, arenaceous and marly arenaceous soils, which contain different types of organic matter. These edaphic characteristics allow different species to grow depending on the water conditions found in the substrates. Thus, these communities represent ecological gradients that vary according to the water factor.

Ass.: *Arundo plinii*-*Rubetum ulmifolii* Biondi, *Casavecchia* & *Gasparri* ass. nova hoc loco

Holotypus: rel. 5 in Table IV in this article.

Diagnostic taxa: *Arundo plinii* Turra, *Rubus ulmifolius* L.

69 Cl.: *SALICI PURPUREAE-POPULETEA NIGRAE* Rivas-Martínez & Cantó ex Rivas-

Martínez, Bascónes, T.E. Díaz, Fernández-González & Loidi 2001

69.1 Ord.: *POPULETALIA ALBAE* Br.-Bl. ex Tchou 1948

All.: *Carici remotae-Fraxinion oxycarpae* Pedrotti ex Pedrotti, Biondi, Allegrezza & Casavecchia all. nova hoc loco

[Syn.: *Fraxinion angustifoliae* Pedrotti 1970 nom. inval. (art. 3b), *Fraxinion angustifoliae* Pedrotti ex Biondi & Casavecchia in Biondi et al. 2010 nom. inval. (art. 5, 43)]

Holotypus: *Carici remotae-Fraxinetum oxycarpae* Pedrotti 1970 corr. 1992 (Pedrotti 1970: rel. 1, tab. 2).

Diagnostic taxa: *Fraxinus angustifolia* Vahl subsp. *oxycarpa* (Willd.) Franco & Rocha Afonso, *Ulmus minor* Mill. subsp. *minor* [= *Ulmus campestris* auct., non L.], *Ranunculus lanuginosus* L. *Carex remota* L., *Rumex sanguineus* L., *Carex pendula* Huds., *C. divulsa* Stokes.

Short description: communities in central-southern Italy dominated by *Fraxinus angustifolia* subsp. *oxycarpa* that occur in marshy plains and in the low-lying, final section of rivers.

Table IV. *Arundo plinii*-*Rubetum ulmifolii* Biondi, *Casavecchia* & *Gasparri* ass. nova (*holotypus:* rel. 5).

No. of relevé	1	2	3	4	5*	Pres.
Altitude (m a.s.l.)	210	.	168	.	180	
Exp.	N	.	NNW	.	SE	
Slope (°)	8	0	30	.	15	
Surface (m ²)	200	150	250	120	20	
Coverage (%)	100	100	100	100	100	
<i>Charact. species of the ass. Arundo plinii-Rubetum ulmifolii</i>						
<i>Rubus ulmifolius</i> Schott	5.5	5.5	5.5	5.5	4.5	6
<i>Clematis vitalba</i> L.	2.2	2.3	1.2	3.4	+	6
<i>Arundo pliniana</i> Turra	4.4	4.4	4.4	4.5	5.5	6
<i>Melissa romana</i> Miller	1.2	2.2	.	1.2	+	4
<i>Charact. species of the class Rhamno catharticae-Prunetea Spinosae, of the ord. Pyro spinosae-Rubetalia ulmifolii and the all. Arundo plinii-Rubion ulmifolii</i>						
<i>Cornus sanguinea</i> L.	2.3	.	.	.	1.2	2
<i>Rubia peregrina</i> L.	1.2	.	.	.	2.3	2
<i>Paliurus spina-christi</i> Miller	.	.	.	+	.	1
<i>Clematis flammula</i> L.	.	.	.	.	+2	1
<i>Rosa sempervirens</i> L.	.	.	.	.	+2	1
<i>Lonicera etrusca</i> Santi	.	.	.	.	+2	1
<i>Other species</i>						
<i>Parietaria diffusa</i> M. et K.	.	1.2	.	+2	.	3
<i>Rumex crispus</i> L.	+	+	.	.	.	2
<i>Dactylis glomerata</i> L.	.	+	.	.	.	1
<i>Silene alba</i> (Miller) Krause	.	.	.	+	.	1
<i>Urtica dioica</i> L.	.	.	1.2	.	.	1
<i>Calystegia sepium</i> (L.) R.Br.	.	+	.	.	.	1

Note: Rel.1, Portonovo (Ancona), 08.10.2013, *Centaurea nigrescens* +; Rel.2, Trave (Ancona), 28.10.2013, *Arum italicum* 1.2, *Potentilla reptans* +, *Foeniculum vulgare* +; Rel.3, Ancona, 29.10.2013, *Oryzopsis miliacea* +; Rel.4, Posatora (Ancona), 29.10.2013, *Inula conyzia* 2.2, *Artemisia verlotorum* 2.3, *Cirsium vulgare* +, *Ailanthus altissima* 1.2, *Robinia pseudoacacia* 1.2; Rel.5, Monte Conero (Ancona), 12.05.1998, *Pteridium aquilinum* +2, *Asparagus acutifolius* +.

70 Cl.: *SALICETEA PURPUREAE* Moor 1958
70.1 Ord.: *SALICETALIA PURPUREAE* Moor 1958

All. *Salicion apennino-purpureae Allegrezza & Biondi all. nova hoc loco*

Holotypus: *Salicetum apenninae* Pedrotti, Spada & Conti in Pedrotti & Gafta 1996 (Pedrotti & Gafta 1996: rel. 1, p. 153).

Diagnostic taxa: *Salix apennina* Skvortsov, *Salix purpurea* L., *Carex remota* L., *Carex pendula* Hudson, *Euonymus latifolius* (L.) Miller, *Rubus caesius* L., *Clematis vitalba* L., *Prunus avium* L., *Corylus avellana* L., *Rubus ulmifolius* Schott.

Short description: pioneer communities of shrubby willows found in waterways characterised by a torrential regime, in central-northern Italy, which occur in floodplains on gravelly alluvial substrates from the meso- to the supratemperate thermotypes.

71 Cl.: *QUERCETEA ILICIS* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952

Ord.: *PINETALIA HALEPENSIS Biondi, Blasi, Galdenzi, Pesaresi & Vagge ord. novo hoc loco*

Holotypus: *Pistacio lentisci-Pinion halepensis* Biondi, Galdenzi, Pesaresi & Vagge *all. nova hoc loco*

Diagnostic taxa: *Pinus halepensis* Mill., *Pinus pinea* L., *Juniperus oxycedrus* L., *Juniperus phoenicea* L. subsp. *turbinata* (Guss.) Nyman., *Pistacia lentiscus* L., *Myrtus communis* L., *Rosmarinus officinalis* L., *Erica arborea* L.

Short description: native forests of *Pinus halepensis* and *Pinus pinea* (subspecies, varieties and ecotypes). Long-established plantations present within their natural area of occurrence are also included. These forests are prevalently sparse and open and are characterised by shrub species of the order *Pistacio-Rhamnetalia alaterni*, as well as by the presence of chamaephytic and nanophanaerophytic species belonging to the classes *Rosmarinetea officinalis* and *Cisto cretici-Micromerietea julianae*. These pinewoods occur throughout the Mediterranean basin, prevalently in coastal areas and on rocky cliffs, though also in inland areas depending on the different bioclimatic conditions of the territories. They are found from the inframediterranean thermotype to lower mesomediterranean thermotypic horizon.

All: *Pistacio lentisci-Pinion halepensis Biondi, Blasi, Galdenzi, Pesaresi & Vagge all. nova hoc loco*

Holotypus: *Pistacio lentisci-Pinetum halepensis* De Marco, Veri & Caneva 1984 (De Marco et al. 1984: 28 and 29).

[Syn.: *Pistacio lentisci-Pinetum halepensis* Rivas-Martínez, Soriano, Costa 2011 (art. 22)]

Diagnostic taxa: *Pinus halepensis* Mill., *Juniperus phoenicea* L. subsp. *turbinata* (Guss.) Nyman., *Pistacia lentiscus* L., *Myrtus communis* L., *Rosmarinus officinalis* L.

Short description: Rocky woods of *Pinus halepensis* (subspecies, varieties and ecotypes) that occur in the Mediterranean macrobioclimate from the inframediterranean thermotype to the lower mesomediterranean thermotypic horizon.

72 Cl.: *QUERCO ROBORIS-FAGETEA SYLVATICAE* Br.-Bl. & Vlieger in Vlieger 1937

72.2 Ord.: *QUERCETALIA ROBORIS* Tüxen 1931

72.2.3 All.: *Luzulo luzuloidis-Fagion sylvaticae* Lohmeyer & Tüxen in Tüxen 1954

Suball.: *Luzulo pedemontanae-Fagion sylvaticae Ubaldi ex Ubaldi, Biondi & Casavecchia suball. nov. hoc loco*

[*Luzulo pedemontanae-Fagion sylvaticae* Ubaldi 2003 *nom. inval.* (art. 5)]

Holotypus: *Luzulo pedemontanae-Fagetum* Oberdorfer & Hoffmann 1967

Diagnostic taxa: *Luzula pedemontana* Boiss. et Reuter, *L. nivea* (L.) Lam. et DC., *L. sieberi* Tausch subsp. *sieberi*

Short description: communities of acidophilous beech forests found in the north-western Apennines, occasionally containing chestnut trees, which occur from the upper mesotemperate to the lower supratemperate thermotype.

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