

# Progress of vegetation studies in Bulgaria: an updated phytosociological checklist of the high-rank syntaxa

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**Abstract.** Studies of the Bulgarian vegetation have started a century ago, but for many reasons for a long time they were defined by the dominant approach. Within the last two decades, many syntaxa occurring in the country have been identified in the result of intensive field work and development of national and international databases, as well as after adoption of the standards of the European vegetation classification. The first complete checklist of the Bulgarian syntaxa under the Braun-Blanquet approach was compiled more than a decade ago and has been in need of updating in compliance with the latest national and international scientific achievements. The current paper aims at compiling an updated checklist of the Bulgarian high-rank syntaxa dominated by vascular plants. According to the results, Bulgarian vegetation features 68 classes, 135 orders and 259 alliances. These syntaxa account for 65% of the European classes, 45% of the orders and 23% of the alliances. A number of uncertain and insufficiently researched units illustrate the knowledge gaps and a need for further studies.

**Key words:** Braun-Blanquet approach, classification, syntaxonomy, vegetation diversity

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## Introduction

The high floristic (Petrova & Vladimirov, 2018) and biogeographic (Meshinev 2007) diversity of Bulgaria are some of the major reasons for a great variety of plant community types. Studies of the vegetation diversity have more than 100 years of history behind its back in the country and a significant number of syntaxonomic units have been identified (Apostolova & Slavova 1997). Due to historical and political reasons, most of them have been defined

according to the dominant approach (Aleksandrova 1969) applied in the country up to 1990. A few studies by foreign researchers reported vegetation types defined according to the floristic and ecological school (e.g., Horvat & al. 1937; Soó 1957; Simon 1958; Vicherek 1971; Mucina & al. 1986, 1990). The first overview of the vegetation in Southeast Europe, namely on the Balkan Peninsula, following the Braun-Blanquet approach was published by Horvat & al. (1974). The authors reported 14 classes, 15 orders and nine alliances directly for the Bulgarian

territory, and another nine classes, seven orders and 17 alliances referred indirectly to it.

Adoption of the European vegetation classification standards by the national researchers started at the beginning of the 21<sup>st</sup> century, following an activation of the scientific relations with colleagues from the countries of Central and West Europe. Between 1990 and 2000, researchers in Bulgaria have maintained personal communications with many colleagues and have acquired many invaluable literary sources for comparative analyses. Since 2000, vegetation research in Bulgaria has been continuously shifting from the dominant school to the floristic and ecological school (Braun-Blanquet 1964; Westhoff & van der Maarel 1978), and the new approach was accepted entirely by the botanists. All that has expanded cooperation with the European scientists and has intensified the national vegetation survey. The development of Natura 2000 network and the need of national habitat identification and description (Kavrakova & al. 2009; Biserkov 2015) have demanded further development of the vegetation studies and classification. In the last decade, numerous studies have been published proving the presence of different vegetation types on the territory of Bulgaria. The obtained syntaxonomic data though are inconsistent for some particular vegetation types.

Apostolova and Slavova (1997) attempted to collect all available data on the identified and published syntaxa for Bulgaria, regardless of the methodological approach. Phytosociological research was uplifted by the creation of the Bulgarian Vegetation Database in 1999 (GIVD ID EU-BG-001, Apostolova & al. 2012) and the latest extension of the vegetation databases for the region (Vassilev & al. 2020b). For the purposes of the Bulgarian Vegetation Database, a complete list was prepared of the existing and expected syntaxa for Bulgaria. It included 53 classes, 156 alliances and 226 associations.

However, the first complete checklist of the Bulgarian syntaxa according to the Braun-Blanquet approach was elaborated and published by Tzonev & al. (2009). The authors summarized the entire hitherto published literature and presented the information in an analytical mode. The checklist included 39 classes,

67 orders, 94 alliances, 218 associations, and 48 sub-associations, and 10 additional classes expected for the country. Assenov (2021) synthesized the national vegetation diversity in his monograph on biogeography and natural resources of Bulgaria, announcing 53 classes, 154 alliances and 228 associations.

Since the moment when the Braun-Blanquet approach has been applied by the different researchers, variations in the original methodology have transpired among the studies (Guarino & al. 2018). Foundation of the European Vegetation Survey (EVS) within the International Association for Vegetation Science (IAVS) in 1992 (<http://euroveg.org>, accessed 18.05.2023) and application of common data standards (Mucina & al. 2000) have taken the unification and coherence of the vegetation studies at European level. The latest and most comprehensive overview of the European vegetation has provided an international standard for the high-rank syntaxa (Mucina & al. 2016). It contains concise ecological and chorological descriptions and profound synonym lists. That overview presents a classification of the vegetation types dominated by vascular plants (European Vegetation Classification (EVC1), vegetation of mosses and lichens (EVS2), and algal communities (EVC3). The checklist includes 109 classes, 301 orders and 1105 alliances of the vascular plant vegetation (according to Preislerová & al. 2022). The basic unit of EVC is alliance. According to Willner (2020), “alliances could be perceived as more fundamental units than the associations”, as temporally more stable units with a distinguishable group of character species. He defined the alliance as “a moderately broad vegetation unit that either has one or several absolute character taxa or that can be interpreted as the central alliance of an order”. The EuroVegChecklist (EVC, Mucina & al. 2016) serves as a unification tool for the vegetation studies in different countries with a view to different historical periods. The EVC offers common standards accepted broadly by the international scientific society (e.g., Škvorc & al. 2017; Bergmeier 2020) and offers an opportunity for further updates and scientific decisions.

In the light of the latest international standards, the objectives of this paper are: (i) to compile an updated

checklist of classes, orders and alliances based on the existing data about vegetation dominated by vascular plants in Bulgaria; (ii) to adapt the Bulgarian vegetation checklist of high-rank syntaxa to the latest European syntaxonomic system (EVC); and (iii) to provide an opportunity for analyses of the local vegetation diversity and knowledge gaps.

## Methods

The current checklist was created by selection of alliances with verified, very likely and uncertain occurrence in Bulgaria, presented in the study of Preislerová & al. (2022). The resulting list was accomplished at class level, following EVC (Mucina & al. 2016). All high-rank syntaxa that characterize Bulgarian vegetation diversity were compared with the Bulgarian checklist compiled by Tzonev & al. (2009). Although the purpose of the checklist was to cover the communities dominated by vascular plants, it also included the class *Charetea intermediae*, because of the references for its occurrence in the country.

Vegetation at the class level was divided according to physiognomic and ecological criteria (Box & Fujiwara 2013) into five groups. Within classes, the syntaxa were arranged according to the EVC sequence. Each syntaxon was accompanied by a concise description, mostly taken from Mucina & al. (2016). The descriptions were intended to relate to the territory of the country, without being affected by the global distribution of the particular unit. Whenever relevant, some adjustments for the Bulgarian territory were added derived from literary sources and personal experience.

References have been added to all syntaxa, if the original studies have explicitly indicated affiliation to the vegetation of Bulgaria. The references have been aimed at proving the occurrence of the vegetation types in the country, as well as at indicating the knowledge gaps. Some of these sources include raw data, synoptic tables or other types of original data collected in Bulgaria, while others claim by indirect or inductive reasoning the presence of a particular syntaxon in the country. Whenever recent nomenclature changes occur, the references show the original one in brackets. Some of the recent nomenclature changes unify different former syntaxa within recent one. In some publications syntaxa from both former and recent nomenclature are given simultaneously. In such cases former syntaxa are indicated in parenthesis. Correspondence of the earlier nomenclature with the recent one follows the authority of the syntaxa. The synopses provided by Apostolova & al. (2012), Assenov (2021) and the syntaxa mentioned in the Bulgarian Red Data Book (Biserkov 2015) have not been included in the references. The same is valid for other literature sources referring only to some earlier studies without particular original contribution. Unpublished literature, such as dissertations and project reports, has not been considered too. Some studies do not offer clear-cut syntaxonomic decisions for the high-rank syntaxa (e.g., Valchev 2000), but on the basis of synoptic tables high-rank syntaxa could be assumed; such cases are marked in the list with an asterisk (\*). The syntaxa marked with a question mark (?) indicate uncertain occurrence in Bulgaria. The syntaxa marked with plus (+) are added to the list on the basis of the latest results in vegetation studies and evidenced distribution at European level. Considering the latest large-scale syntheses of some vegetation types in Europe, some cases requiring further investigation are denoted with an exclamation mark (!). The present work does not claim to represent the entire vegetation diversity at the association level and below, which will be attempted elsewhere.

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## Results

According to the current list presented in the Appendix, Bulgarian vegetation diversity features 68 classes, 135 orders and 259 alliances (Table 1). Six classes, 12 orders and 55 alliances are uncertain for the country. The highest diversity is manifest by herbaceous vegetation, regardless of the syntaxonomic rank. Temperate shrub communities are widespread in the country, but do not have significant vegetation diversity. Shrub vegetation does not include uncertain units.

**Table 1.** Numbers of high-rank syntaxa grouped according to physiognomic criteria

Vegetation type	Class			Order			Alliance		
	Confirmed	Uncertain	Total	Confirmed	Uncertain	Total	Confirmed	Uncertain	Total
Forest vegetation	10	2	12	18	3	21	36	10	46
Shrub vegetation	2	0	2	3	0	3	10	0	10
Herbaceous and dwarf shrub vegetation	27	4	31	58	6	64	82	28	110
Aquatic and wetland vegetation (incl. freshwater algae)	13	0	13	23	1	24	39	7	46
Anthropogenic vegetation	10	0	10	21	2	23	37	10	47

The syntaxa referred to Bulgarian vegetation have been mentioned in 118 articles or books published between 1937 and 2023. *Carpino-Fagetea sylvaticae*, *Quercetea pubescentis*, *Festuco-Brometea*, *Scheuchzeria palustris-Caricetea fuscae* and *Molinio-Arrhenatheretea* are the most explored classes. The classes *Alnetea glutinosae*, *Franguletea*, *Junipero-Pinetea sylvestris*, *Stipo giganteae-Agrostietea castellanae*, *Poetea bulbosae*, *Stipo-Trachynietea distachyae*, *Polypodietae*, *Zosteretea*, *Ruppietea maritimae* and numerous orders and alliances still lack regional studies.

## Discussion

The updated current checklist shows that the first complete overview of Bulgarian vegetation (Tzonev & al. 2009) closely reflects the national vegetation diversity, though the contemporary checklist contains extra 29 classes, 68 orders and 161 alliances on top of those reported earlier by the authors. Compared to the EVC (Mucina & al. 2016), Bulgarian vegetation reflects 62% of the classes, 45% of the orders and 23% of the alliances found in Europe. Floristic richness and orographic diversity have been deemed prime predictors of vegetation diversity at the class and alliance level (Jimenez-Alfaro & al. 2014), which is fully applicable to the territory of Bulgaria. The overview presented by Jimenez-Alfaro & al. (2014) has reported similar numbers for Bulgaria (50 classes and 144 alliances) close to those listed by Tzonev & al. (2009), but

short of the currently displayed calculation. The distribution maps of alliances in Europe (Preislerová & al. 2022) confirm that Bulgaria ranks among the richest territories of vegetation types. The authors present 184 verified and 64 uncertain alliance occurrences for Bulgaria.

It is not surprising that herbaceous vegetation manifests the highest level of diversity. This can be explained by a mixture of biogeographic patterns and a long legacy of afforestation (Meshinev 2007). The growing number of studies on anthropogenic vegetation types logically reflects the recent changes in semi-natural and agricultural areas.

Nomenclature updates following the latest editions of the International Code of Phytosociological Nomenclature (Weber & al. 2000; Theurillat & al. 2021) have brought about changes affecting many syntaxa in the regional studies. Such changes will certainly happen in the future, along with the enhanced knowledge of vegetation structure and ecology and the application of extensive database analyses. For example, in the Appendix, the alliance *Bassio laniflorae-Bromion tectorum* is kept in *Sedo-Scleranthetea*, as proposed by Mucina & al. (2016), but the author of the present study is confident that the proper place of this alliance is in *Festucetalia vaginatae* and *Koelerio-Corynephoretea canescentis*, as Valcheva & al. (2021) have suggested.

Since the publication of EVC, several studies on European scale have offered a new insight and critical assessment of EVC and have brought about

corrections in the existence and distribution of the studied syntaxa. The study of Douđa & al. (2016) concerns *Alnion incanae*, *Platanion orientalis*, *Populion albae*, and *Alnion glutinosae*. These alliances have been studied at the association level and *Alnion incanae* and *Populion albae* have been confirmed for Bulgaria. The unified classification of the European fens of *Scheuchzerio palustris-Caricetea fuscae* at the alliance level (Peterka & al. 2017) matches the units for Bulgaria. Some differences with the syntaxonomic scheme of beech forests proposed by Mucina & al. (2016) can be found in the study of Willner & al. (2017). As far as their proposals generally do not change the alliances presented in Bulgaria, this study could be used as a source of information for further synthesis of the beech forest vegetation. A recent overview of coastal dune vegetation (Marcenò & al. 2018) has confirmed the syntaxa along the Bulgarian Black Sea coast (Tzonev & al. 2005) and in the EVC. The authors suggest a further study of *Scabiosion ucrainicae*, which has been represented so far by a limited number of relevés. An overview of the European marsh vegetation of the class *Phragmito-Magnocaricetea* (Landucci & al. 2020) has suggested changes which affect the Bulgarian syntaxa. The authors reject *Typhion laxmannii* and *Phalaridion arundinaceae* on the grounds of insufficient diagnostic species. The alliance *Meliloto dentati-Bolboschoenion maritimi* has been also excluded from the class. Accordingly, in the Appendix, these alliances have been omitted. Landucci & al. (2020) have proposed to exclude the order *Saccharetalia ravennae* with its alliance *Imperato cylindricae-Saccharion ravennae* from *Phragmito-Magnocaricetea*, where Mucina & al. (2016) has classified them, and to move them either to *Juncetea maritimi* or *Molinio-Arrhenatheretea*. Further studies will be needed to classify them correctly. However, in the current list these syntaxa have been retained and marked with (!) to indicate the need of clarification. The results of the study of European mountain river gravel bars (Kalníková & al. 2021) have confirmed the presence of *Calamagrostion pseudofragmitae* on the territory of Bulgaria via the established presence of the subassociation *Tussilagini farfarae-Calamagrostietum pseudophrag-*

*mitae phalaridetosum arundinaceae* (Kopecký 1968) Kalníková & al. 2021. The order *Carpinetalia betuli* has been recently explored and classified at alliance level (Novák & al. 2023). The revised classification does not support the presence of *Erythronio-Carpinion* alliance. On the grounds of that opinion, the alliance was excluded from the checklist and merged with *Carpinion betuli*. The name *Trachystemono orientalis-Carpinion betuli* has been adopted, instead of *Castaneo sativae-Carpinion orientalis* (Çoban & Willner 2018).

The syntaxa marked by (?) are largely unexplored on the territory of Bulgaria. Such syntaxa remain uncertain and need confirmation for the country. However, most uncertain units are left in the current checklist to direct the researchers' attention to gaps in knowledge and unsolved problems. For example, *Trifolio anatolici-Polygonetea arenastri* is mentioned as highly probable by Preislerová & al. (2022), which was the reason for including it in the Appendix, although the presence of communities of this class remains uncertain. Another case marked with a question mark is *Franguletea*. In a recent study (Koljanin & al 2023), the presence of alliance *Salicion cinereae* as a subordinating syntaxon of *Franguletea* has been confirmed for the western Balkans. Suitable habitats with a couple of diagnostic species for that shrubland vegetation bound to the river alluviums can be also found in the eastern part of the Balkan Peninsula and merit sampling. Similarly, the alliance *Romuleion* has been studied in the southern Balkans (Čarni & al. 2014) and, hopefully, is presented in South Bulgaria too. Another case is *Junipero-Pinetea sylvestris*, with its alliance *Juniperion excelso-foetidissimae* described in neighbouring North Macedonia. Communities of *Juniperus excelsa* in Southwest Bulgaria have been classified by Tzonev & Dimitrov (2005), but referred to *Ostryo-Carpinion orientalis* Horvat 1959. A data set analysis common for both countries is needed for confirmation or rejection of the class in the country.

*Oxycocco-Sphagnetes* studied by Jiroušek & al. (2022) has shown that active raised bogs do not exist in Bulgaria. This class has been mentioned in the earlier studies of mire vegetation in the Bulgarian mountains (Hajek & al. 2008; Roussakova 2000), although



by a very limited number of relevés, which was the reason to keep the class with its subordinate units in the Appendix.

Development of Pan-European, or even Eurasian syntaxonomic classification aims at establishing ecologically meaningful and easily recognizable units (Dengler 2017) and at aiding the nature management and environmental policy (Peet & Roberts 2013). Therefore, there is a growing need in a harmonized international sustainable classification system. EVC is the result of many years of collaboration between phytosociologists across Europe. Establishment of phytocoenological data standards and European Vegetation Archive (Chytrý & al. 2016) within the EVS working group have enhanced the efforts for national and international syntaxonomic revisions and creation of a unified vegetation classification. The purpose of the European Vegetation Classification Committee (EVCC) established in 2017 is to support the procedures for updating the European Vegetation Classification (Biurrun & Willner 2020). In order to legitimize any further updates and newly described syntaxa, scientific decisions must be approved by the EVCC (<http://euroveg.org/evc-committee> accessed 18.05.2023).

## Conclusion

The presented checklist of high-rank syntaxa unifies and updates the Bulgarian vegetation classification in line with the latest European standards. It can be used as a basis for further syntaxonomic research. Vegetation classification provides appropriate units for ecosystem studies, nature conservation activities, planning and management of ecosystem resources. It shows the gaps in knowledge and, hopefully, encourages further research in that area. Phytosociology is an evolving science. Still, there exist different interpretations of plant communities by regions and scientists, although the EVC offers common standards. Therefore, changes are likely to occur in the future. Cooperation within scientific community will certainly help the further development of a consistent classification of vegetation in Bulgaria.

## Appendix

### LIST OF SYNTAXA

#### FOREST VEGETATION

##### Coniferous forests

##### Class *Vaccinio-Piceetea* Br.-Bl. in Br.-Bl. & al. 1939

Coniferous forests at high altitudes of the mountains on oligotrophic soils.

Horvat 1954; Simon 1958; Horvat & al. 1974; Michalik 1990; Roussakova 2000; Roussakova, Dimitrov 2003, 2005; Dimitrov & al. 2004a, 2004b; Tzonev & al. 2009; Nikolov, Dimitrov 2015; Velev & al. 2016

##### Order *Piceetalia excelsae* Pawłowski & al. 1928

Mountain spruce and pine forests on nutrient-poor soils.

Simon 1958 [*Vaccinio-Piceetalia* Br.-Bl. 1939]; Horvat & al. 1974 [*Vaccinio-Piceetalia*]; Michalik 1990 [*Vaccinio-Piceetalia*]; Roussakova 2000 [*Vaccinio-Piceetalia* Br.-Bl. 1939]; Roussakova, Dimitrov 2003, 2005; Dimitrov & al. 2004a, 2004b; Tzonev & al. 2009; Nikolov & Dimitrov 2015

##### Alliance *Piceion excelsae* Pawłowski & al. 1928

Mountain spruce forests on nutrient-poor soils.

Horvat & al. 1974 [*Vaccinio-Piceion*]; Michalik 1990 [*Vaccinio-Piceion*], 1992 [*Vaccinio-Piceion*]; Dimitrov 2003 [*Piceion abietis* Pawłowski in Pawłowski, Sokolowski et Walisch 1928]; Dimitrov & al. 2004b [*Piceion abietis* Pawłowski in Pawłowski, Sokolowski et Walisch 1928]; Tzonev & al. 2009; Nikolov & Dimitrov 2015; Velev & al. 2016; Nikolov & Dimitrov 2023

##### Alliance *Pinion peucis* Horvat 1950

Acidophilous *Pinus peuce* forests in the Balkan Range, and the Rhodopids.

Horvat & al. 1974; Dimitrov & al. 2004a; Tzonev & al. 2009; Nikolov & Dimitrov 2015; 2023

##### Order *Pinetalia sylvestris* Oberd. 1957

Mountain pine forests on nutrient-poor soils.

Alliance *Dicrano-Pinon sylvestris* (Libbert 1933) W. Matuszkiewicz 1962 nom. cons.

Velev & al. 2016

##### Order *Athyrio filicis-feminae-Piceetalia* Hadač in Hadač & al. 1969

Mountain spruce, fir and pine forests on nutrient-rich soils.

Alliance *Abieti-Piceion* (Br.-Bl. in Br.-Bl. & al. 1939) Soó 1964  
Mountain fir forests.

##### ?Order *Vaccinio uliginosi-Pinetalia sylvestris* Passarge 1968

Open pine and spruce forests in oligotrophic mires.

?Alliance *Vaccinio uliginosi-Pinon sylvestris* Passarge 1968

Open pine forests in oligotrophic mires.

**?Alliance *Eriophoro-Piceion abietis*** Passarge 1968

Open spruce forests in oligotrophic mires.

### **Class *Erico-Pinetea* Horvat 1959**

Relict pine forests and related scrub on calcareous and ultramafic substrates.

Tzonev & al. 2009, 2018; Vassilev & Gavrilova 2015

#### **Order *Erico-Pinetalia* Horvat 1959 nom. cons.**

Montane calcareous relict pine forests.

Tzonev & al. 2009, 2018; Vassilev & Gavrilova 2015

**Alliance *Fraxino orni-Pinion nigrae*** Em 1978

Relict *Pinus nigra* forests on calcareous substrates.

Tzonev & al. 2018; Nikolov & Dimitrov 2023

**?Alliance *Erico-Fraxinion orni*** Horvat 1959 nom. invers.

Relict *Pinus nigra* forests on dolomite and ultramafic substrates.

Vassilev & Gavrilova 2015

**Alliance *Pinion heldreichii*** Horvat 1946

Relict *Pinus heldreichii* forests on calcareous substrates.

Valchev 2000\*; Tzonev & al. 2009

### **Class *Roso pendulinae-Pinetea mugo* Theurillat in Theurillat & al. 1995**

Pine krummholz in the subalpine belts of the mountain ranges.

#### **Order *Junipero-Pinetalia mugo* Boşcaiu 1971**

Pine krummholz in the subalpine belts of the mountain ranges.

Tzonev & al. 2009

**Alliance *Pinion mugo*** Pawłowski & al. 1928

Subalpine silicicolous pine krummholz.

Horvat & al. 1974; Roussakova 2000; Tzonev & al. 2009

### **Temperate broadleaved forests**

#### **Class *Carpino-Fagetea sylvaticae* Jakucs ex Passarge 1968**

Deciduous and mixed forests.

Soó 1964 [*Quercus-Fagetea*]; Horvat & al. 1974 [*Quercus-Fagetea*]; Michalik 1983, 1990 [*Quercus-Fagetea*]; Tzonev 2003 [*Quercus-Fagetea* Br.-Bl. et Vlieger 1937]; Pavlov & Dimitrov 2003 [*Quercus-Fagetea*], 2004 [*Quercus-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937]; Dimitrov & al. 2004a [*Quercus-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937]; Apostolova-Stoyanova & al. 2005 [*Quercus-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937]; Dimitrov & al. 2005 [*Quercus-Fagetea* Br.-Bl. et Vlieger 1937]; Pavlov & al. 2006 [*Quercus-Fagetea* Br.-Bl. et Vllieger in Vlieger 1937]; Tzonev & al. 2006b; 2009 [*Quercus-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937], 2013 [*Quercus-Fagetea* Br.-Bl. et

Vlieger in Vlieger 1937], 2019; Petrova & Tzonev 2020; Pedashenko & al. 2015 [*Quercus-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937]; Sopotlieva & al. 2016 [*Quercus-Fagetea* Br.-Bl. et Vllieger in Vlieger 1937]; Vassilev & al. 2016; Velev & al. 2016; Gavrilova, Vassilev 2021; Grigorov & al. 2022, 2023a, 2023b

#### **Order *Luzulo-Fagetalia sylvaticae* Scamoni et Passarge 1959**

Acidophilous beech and mixed fir-beech forests on nutrient-poor soils in the mountains.

Vassilev & al. 2016; Petrova & Tzonev 2020; Alexandrova & al. 2020

**Alliance *Luzulo-Fagion sylvaticae*** Lohmeyer et Tx. in Tx. 1954  
Acidophilous beech and mixed fir-beech forests in the mountains.

Pavlov & al. 2006; Tzonev & al. 2006b; Petrova & Tzonev 2011, 2020; Velev & al. 2016; Alexandrova & al. 2020; Nikolov & Dimitrov 2023

#### **Order *Fagetalia sylvaticae* Pawłowski 1928**

Basiphilous beech and mixed fir-beech forests in the mountains.

Horvat & al. 1974; Michalik 1990; Pavlov & Dimitrov 2002, 2003, 2004; Dimitrov & al. 2004a; Apostolova-Stoyanova & al. 2005; Pavlov & al. 2006; Tzonev & al. 2006b, 2009, 2009 [*Fraxinetalia* Scamoni et Passarge 1959], 2013, 2019b; Pedashenko & al. 2015; Vassilev & Gavrilova 2015; Sopotlieva & al. 2016; Neykova & al. 2019\*; Petrova & Tzonev 2020; Alexandrova & al. 2020; Gavrilova & Vassilev 2021; Georgiev 2021 [*Fraxinetalia* Scamoni et Passarge 1959]; Grigorov & al. 2022, 2023a, 2023b

**Alliance *Aremonio-Fagion*** (Horvat 1950) Borhidi in Török & al. 1989

Refugial basiphilous beech and mixed fir-beech forests in the mountains.

Pavlov & al. 2006

**Alliance *Fagion sylvaticae*** Luquet 1926

Basiphilous beech and mixed fir-beech forests in the mountains.

Soó 1963 [*Fagion dacicum* Soó 62]; Horvat & al. 1974 [*Fagion moesiicum*]; Michalik 1983, 1990, 1992; Pavlov & Dimitrov 2003 [*Fagion moesiicae* Horvat, Glavac et Ellenberg 1974], 2004 [*Cephalanthero-Fagion sylvaticae* Oberd. 1957]; Dimitrov & Glogov 2003 [*Fagion moesiicae*]; Dimitrov & al. 2004a [*Asperulo-Fagion* Tüxen 1955]; Pavlov & al. 2006 [*Cephalanthero-Fagion sylvaticae* Tüxen 1955, *Asperulo-Fagion sylvaticae* Tüxen 1955]; Tzonev & al. 2006b [*Cephalanthero-Fagion sylvaticae* Tüxen 1955, *Asperulo-Fagion sylvaticae* Tüxen 1955], 2009, 2009 [*Cephalanthero-Fagion sylvaticae* Tüxen 1955]; Tzonev 2011 [*Asperulo-Fagion sylvaticae* Tüxen 1955]; Petro-

va & Tzonev 2011 [*Cephalanthero-Fagion sylvaticae* Tüxen 1955]; 2020; Pedashenko & al. 2015; Sopotlieva & al. 2016; Velev & al. 2016; Vassilev & al. 2016 [*Cephalanthero-Fagion sylvaticae* Tüxen 1955]; Alexandrova & al. 2020; Gavrilova & Vassilev 2021; Grigorov & al. 2022, 2023a [*Asperulo-Fagion*, *Cephalanthero-Fagion*], 2023b [*Fagion sylvaticae* s.l., *Cephalanthero-Fagion*]; Nikolov & Dimitrov 2023

**Order *Carpinetalia betuli*** P. Fukarek 1968

Oak-hornbeam and mesic oak forests on deep nutrient-rich soils.

Tzonev & al. 2019; Petrova & Tzonev 2020; Alexandrova & al. 2020

**Alliance *Carpinion betuli*** Issler 1931

Temperate oak-hornbeam forests on deep nutrient-rich soils.

Dimitrov & Glogov 2003 [*Carpinion betuli moesiacum*]; Pavlov & Dimitrov 2004; Apostolova-Stoyanova & al. 2005; Pavlov & al. 2006; Tzonev 2013; Vassilev & Gavrilova 2015; Velev & al. 2016; Tzonev & al. 2009, 2019b; Neykova & al. 2019\*; Petrova & Tzonev 2020; Grigorov & al. 2022, 2023a, 2023b

**Alliance *Erythronio-Carpinion*** (Horvat 1958) Marinček in Wallnöfer & al. 1993

Thermophilous oak-hornbeam forests on deep nutrient-rich soils.

Alexandrova & al. 2020; Nikolov & Dimitrov 2023

**?Alliance *Castaneo sativae-Carpinion orientalis*** Quézel, Barbero et Akman ex Quézel & al. 1993

Thermophilous hornbeam forests on deep nutrient-rich soils of the southern regions.

**Order *Aceretalia pseudoplatani*** Moor 1976 nom. cons.

Scree and ravine maple-lime forests.

**Alliance *Tilio-Acerion*** Klika 1955

Mountain sycamore maple forests, mostly occupying cool ravines.

Pavlov & al. 2006; Tzonev & al. 2009; Velev & al. 2016, Grigorov & al. 2023

**? Alliance *Melico-Tilion platyphylli*** Passarge et G. Hofmann 1968

Thermophilous lime forests on scree slopes at low altitude.s

**Alliance *Fraxino excelsioris-Acerion pseudoplatani*** P. Fukarek 1969

Sub-Mediterranean mesophilous ash-maple scree and ravine forests.

Nikolov & Dimitrov 2023

**?Alliance *Ostryo carpinifoliae-Tilion platyphylli*** (Košir & al. 2008) Čarni in Willner & al. 2016

Sub-Mediterranean xero-thermophilous broad-leaved scree and ravine forests.

**Order *Rhododendro pontici-Fagetalia orientalis*** Passarge 1981  
Euxino-Hyrcanian oriental beech forests.

Tzonev & al. 2009

**Alliance *Fagion orientalis*** Soó 1964

Oriental beech forests.

Soó 1963, 1964; Tzonev & al. 2006b, 2009, 2011

**Class *Quercetea pubescentis*** Doing-Kraft ex Scamoni et Passarge 1959

Thermophilous oak forests.

Jakucs 1961 [*Quercetea pubescenti-petraeae*]; Pavlov & Dimitrov 2004; Apostolova-Stoyanova & al. 2005; Tzonev 2009b; Gogushev 2009; Tzonev & al. 2009, 2018, 2019; Lyubenova & al. 2011; Pedashenko & al. 2015; Vassilev & Gavrilova 2015; Sopotlieva & al. 2016; Vassilev & al. 2016; Alexandrova & al. 2020; Grigorov & al. 2021, 2022, 2023a, 2023b

**Order *Quercetalia pubescenti-petraeae*** Klika 1933

Thermophilous oak forests occupying both acidic and calcareous substrates.

Oberdorfer 1948; Horvat 1954; Jakucs 1961; Horvat & al. 1974 [*Quercetalia pubescentis*]; Tzonev 2003, 2009b, 2013; Pavlov & Dimitrov 2004 [*Quercetalia pubescenti-sessiliflorae* Klika 1938 corr. Moravec in Beguin et Theurillat 1984]; Apostolova-Stoyanova & al. 2005 [*Quercetalia pubescentis* Br.-Bl. 1932]; Gogushev 2009; Tzonev & al. 2009, 2009 [*Fraxino orni-Cotinetalia* Jakucs 1961]; Lyubenova & al. 2011; Pedashenko & al. 2015; Vassilev & Gavrilova 2015; Sopotlieva & al. 2016 [*Fraxino orni-Cotinetalia* Jakucs 1961]; Tzonev & al. 2018, 2019a, 2019b [*Quercetalia pubescentis* Br.-Bl. (1931) 1932]; Vassilev & al. 2016 [*Fraxino orni-Cotinetalia* Jakucs 1961]; Alexandrova & al. 2020; Grigorov & al. 2022, 2023a, 2023b

**Alliance *Quercion petraeae*** Issler 1931

Thermophilous acidophilous oak forests.

Gogushev 2009 [*Quercion pubescenti-sessiliflorae* Br.-Bl. 1932]; Lyubenova & al. 2011

**Alliance *Quercion pubescenti-petraeae*** Br.-Bl. 1932 nom. corr.

Thermophilous calciphilous oak forests.

Tzonev 2009b, 2013

**Alliance *Aceri tatarici-Quercion*** Zólyomi 1957

Thermophilous oak forests on deep soils in the forest-steppe zone.

Jakucs 1961; Horvat & al. 1974 [*Aceri-Quercion illyricum*]; Tzonev 2003; Tzonev & al. 2009, 2019a, 2019b

**Alliance *Fraxino orni-Ostryion*** Tomažič 1940

Sub-Mediterranean, (sub)montane oak and hop-hornbeam



forests on shallow calcareous soils.

Nikolov & Dimitrov 2023

**Alliance *Carpinion orientalis*** Horvat 1958

Low-altitude thermophilous oak and oriental hornbeam forests. Horvat 1954; Gogushev 2009; Tzonev & al. 2009, 2018, 2019; Pedashenko & al. 2015; Vassilev & Gavrilova 2015; Alexandrova & al. 2020; Grigorov & al. 2021

**Alliance *Syringo-Carpinion orientalis*** Jákucs 1959

Thermophilous oriental-hornbeam forests on calcareous substrate.

Jákucs 1961; Horvat & al. 1974; Dimitrov & Glogov 2003; Pavlov & Dimitrov 2004; Apostolova-Stoyanova & al. 2005; Tzonev 2009b; Tzonev & al. 2009, 2019b; Sopotlieva & al. 2016; Grigorov & al. 2021

**Alliance *Quercion frainetto*** Horvat 1958 nom. corr.

Thermophilous deciduous oak forests on slightly acidic deep soils.

Horvat 1954; Horvat & al. 1974 [*Quercion frainetto*]; Dimitrov & Glogov 2003 [*Quercion frainetto*]; Roussakova & Tzonev 2003, 2011 [*Quercion frainetto* Horvat 1958]; Gogushev 2009; Tzonev 2009b; Tzonev & al. 2009, 2019a, 2019b [*Quercion frainetto* Ht. 1954]; Lyubenova & al. 2011; Pedashenko & al. 2015; Grigorov & al. 2022, 2023; Alexandrova & al. 2020; Grigorov & al. 2023b

**Alliance *Quercion petraeo-cerridis*** Lakušić et B. Jovanović in B. Jovanović & al. ex Čarni et Mucina 2015

Thermophilous oak forests in the mountain regions. Pedashenko & al. 2015; Sopotlieva & al. 2016; Tzonev & al. 2019; Alexandrova & al. 2020; Grigorov & al. 2023a, 2023b; Nikolov & Dimitrov 2023

**?Alliance *Abietion cephalonicae*** Horvat & al. 1974

Relict supra-Mediterranean Hellenic fir and black pine forests.

**Class *Quercetea robori-petraeae* Br.-Bl. et Tx. ex Oberd. 1957**

Acidophilous oak forests on nutrient-poor soils.

Dimitrova & al. 2007, Tzonev & al. 2011 [*Quercus-Fagetes* Br.-Bl. et Vliieger 1937], 2019b [*Quercus-Fagetes* Br.-Bl. et Vliieger 1937]; Vassilev & Gavrilova 2015 [*Quercus-Fagetes* Br.-Bl. et Vliieger 1937]

**Order *Quercetalia roboris*** Tx. 1931

Acidophilous oak forests on nutrient-poor soils.

Dimitrova & al. 2007

**Alliance *Agrostio-Quercion petraeae*** Scamoni et Passarge 1959

Temperate acidophilous oak forests on nutrient-poor soils.

**Alliance *Castaneo-Quercion petraeae*** Soó 1964

Acidophilous chestnut-oak forests on nutrient-poor soils. Dimitrova & al. 2007 [*Quercion robori-petraeae*]

**Class *Betulo carpaticae-Alnetea viridis* Rejmánek ex Boeuf, Theurillat, Willner, Mucina et Simler in Boeuf & al. 2014**

Subalpine herb-rich alder and willow scrub.

Horvat & al. 1974 [*Betulo-Adenostyletea*]; Michalik 1990 [*Betulo-Adenostyletea*]

**Order *Alnetalia viridis*** Rübél ex Karner et Willner in Willner et Grabherr 2007

Subalpine herb-rich alder and willow scrub.

**Alliance *Alnion viridis*** Schnyder 1930

Subalpine green alder scrub on fertile soils.

**?Alliance *Salicion pentandrae*** Br.-Bl. 1967

Subalpine calcicolous willow krummholz.

**Class *Alno glutinosae-Populetea albae* P. Fukarek et Fabijanić 1968**

Riparian gallery of azonal alluvial forests.

Tzonev 2009b; Tzonev & al. 2009 [*Populetea albae* Br.-Bl. 1962]; Pedashenko & al. 2015 [*Salici purpureae-Populetea nigrae* Rivas-Martinez et Cantó ex Rivas-Martinez & al. 2001]; Petrova, Tzonev 2020; Alexandrova & al. 2020; Georgiev 2021 [*Populetea albae* Br.-Bl. 1962]

**Order *Populetea albae*** Br.-Bl. ex Tchou 1949 nom. cons.

Mediterranean and sub-Mediterranean riparian gallery forests.

Horvat & al. 1974; Dimitrov & al. 2005; Pedashenko & al. 2015 (+)**Alliance *Populion albae*** Br.-Bl. ex Tchou 1949  
Floodplain forests frequently widespread in alluvia of large rivers in the dry climate.

Douda & al. 2016

**Alliance *Platanion orientalis*** I. Kárpáti et V. Kárpáti 1961

*Platanus* riparian gallery forests.

Pedashenko & al. 2015

**Order *Alno-Fraxinetalia excelsioris*** Passarge 1968

Floodplain riparian forests on nutrient-rich alluvial soils.

Pavlov, Dimitrov 2002; Tzonev 2009b, Petrova & Tzonev 2020; Alexandrova & al. 2020

**Alliance *Alnion incanae*** Pawłowski & al. 1928

Horvat & al. 1974 [*Alno-Ulmion*]; Dimitrov & al. 2005; Tzonev & al. 2009; Douda & al 2016; Petrova & Tzonev 2020; Alexandrova & al. 2020; Georgiev 2021; Nikolov & Dimitrov 2023

**Alliance *Fraxino-Quercion roboris*** Passarge 1968

Alder-ash and oak riparian floodplain forests on nutrient-rich alluvial soils.

Tzonev 2009b

**Alliance *Alno-Quercion roboris*** Horvat 1950

Alder-oak riparian floodplain forests on nutrient-rich alluvial soils.

Soó 1957 [*Ulmion* Simon 1955]; Roussakova & Tzonev 2003;

Tzonev & al. 2009

**Class *Salicetea purpureae*** Moor 1958

Willow and tamarisk scrub and low open forests of riparian habitats.

Tzonev 2009a, 2009b; Tzonev & al. 2009, 2019b [*Salicetea albae* Moor 1958]; Grigorov & al. 2023

**Order *Salicetalia purpureae*** Moor 1958

Willow scrub and low open forests of riparian habitats.

Tzonev 2009a, 2009b; Tzonev & al. 2009, 2019b; Grigorov & al. 2023

**Alliance *Salicion eleagno-daphnoidis*** (Moor 1958) Grass 1993

Willow scrub on the gravelly stream banks in the submontane to subalpine belts.

Nikolov & Dimitrov 2023

**Alliance *Salicion albae*** Soó 1951

Willow and poplar low open forests of lowland to submontane river alluvia.

Tzonev 2009a, 2009b; Tzonev & al. 2009, 2019b; Grigorov & al. 2023

**Alliance *Salicion triandrae*** T.Müller et Görs 1958

Willow scrub on loamy-sandy sedimentary river banks in the lowland to submontane belts.

**Order *Tamaricetalia ramosissimae*** Borza et Boşcaiu ex Dolğu & al. 1980

Tamarisk riverine scrub of the lowland rivers.

**Alliance *Tamaricion parviflorae*** I. Kárpáti et V.Kárpáti 1961

Tamarisk riverine scrub on coarse gravelly soils on lowland river banks.

**Alliance *Artemisio scopariae-Tamaricion ramosissimae*** Simon et Dihoru 1963

Tamarisk riverine scrub on coarse gravelly soils on lowland rivers banks.

**Class *Alnetea glutinosae*** Br.-Bl. et Tx. ex Westhoff & al. 1946

Mesotrophic regularly flooded alder scrub.

**Order *Alnetalia glutinosae*** Tx. 1937

Mesotrophic regularly flooded alder scrub.

**Alliance *Alnion glutinosae*** Malcuit 1929

Mesotrophic regularly flooded alder scrub

**?Class *Franguletea Doing*** ex Westhoff in Westhoff et Den Held 1969

Willow dominated shrubs.

**?Order *Salicetalia auritae*** Doing 1962

Willow dominated shrubs.

**?Alliance *Salicion cinereae*** T. Müller et Görs ex Passarge 1961

Willow dominated shrubs.

**Mediterranean and sub-Mediterranean forests****?Class *Junipero-Pinetea sylvestris*** Rivas-Mart. 1965 **nom. invers.**

Relict oro-Mediterranean and sub-Mediterranean dry pine and juniper forests and related scrub.

**?Order *Berberido creticae-Juniperetalia excelsae*** Mucina in Mucina & al. 2016

Relict sub-Mediterranean dry pine and juniper forests.

**?Alliance *Juniperion excelso-foetidissimae*** Em ex Matevski & al. 2010

Sub-Mediterranean montane tall juniper woods on shallow soils over limestone, schist and ultramafic substrates.

**SHRUB VEGETATION****High mountain dwarf shrubs****Class *Salicetea herbaceae*** Br.-Bl. 1948

Snowbed vegetation at high altitudes.

Mucina & al. 1986; Mucina & al. 1990; Roussakova 2000; Tzonev & al. 2009

**Order *Salicetalia herbaceae*** Br.-Bl. in Br.-Bl. et Jenny 1926

Snowbed vegetation at high altitudes.

Horvat & al. 1937; Mucina & al. 1990; Roussakova 2000; Tzonev & al. 2009;

**Alliance *Salicion herbaceae*** Br.-Bl. in Br.-Bl. et Jenny 1926

Snowbed communities on siliceous substrates in the alpine belt.

Horvat & al. 1937, 1974; Mucina & al. 1990; Roussakova 2000; Tzonev & al. 2009

**Alliance *Festucion picturatae*** Krajina 1933 corr. Dúbravcová

2007

Snowbed tall grasslands of stabilized siliceous scree gullies irrigated by melt waters in the alpine belt.

Simon 1958 [*Festucion pictae* Krajina 1933]; Horvat & al. 1974 [*Festucion pictae*]; Roussakova 2000 [*Festucion pictae* Kraina 1933]; Tzonev & al. 2009 [*Festucion pictae* Kraina 1933]

**Alliance *Ranunculion crenati*** Lakušić 1968

Snowbed vegetation on siliceous substrates in the alpine belt.

### Temperate shrubland vegetation

#### Class *Crataego-Prunetea* Tx. 1962 nom. cons.

Scrub and mantle vegetation.

Dimitrov & al. 2004a [*Rhamno-Prunetea* Rivas Goday et Borja 1961]; Tzonev & al. 2009 [*Rhamno-Prunetea* Rivas Goday et Borja ex Tüxen 1962]; Pedashenko & al. 2015 [*Rhamno-Prunetea* Rivas Goday et Borja Carbonell 1961]; Vassilev & al. 2020; Grigorov & al. 2021

#### Order *Prunetalia spinosae* Tx. 1952

Scrub and mantle vegetation.

Horvat & al. 1974 [*Prunetalia*]; Dimitrov & al. 2004a; Tzonev & al. 2009; Pedashenko & al. 2015; Vassilev & al. 2020

**Alliance *Berberidion vulgaris*** Br.-Bl. ex Tx. 1952 nom. cons.  
Sub-Mediterranean thermophilous scrub.

Soó 1957 [*Prunion spinosae* Soó 1940, *Berberidion* Br.-Bl. P.p.]; Dimitrov & al. 2004a [*Prunion spinosae* Soó (1930)1940]; Pedashenko & al. 2015; Vassilev & al. 2020; Grigorov & al. 2021

**Alliance *Astrantio-Corylion avellanae*** Passarge 1978

Hazel scrub on nutrient-rich soils in the hilly regions and low mountain belts.

Dimitrov & Glogov 2003 [*Crataego-Corylion*]

**Alliance *Brachypodio pinnati-Juniperion communis*** Mucina in Mucina & al. 2016

Low-altitude thermophilous juniper scrub on calcareous substrates.

**Alliance *Prunion fruticosae*** Tx. 1952

Subcontinental and continental scrub in the forest-steppe zone.

Horvat & al. 1974

#### Order *Paliuretalia* Trinajstić 1979

Thermophilous mantle and šibljak fringing oak forests.

**Alliance *Fraxino orni-Cotinion*** Soó 1960

Thermophilous mantle vegetation fringing oak forests.

**Alliance *Buxo-Syringion*** P. Fukarek ex Diklić 1965

Sub-Mediterranean thermophilous scrub.

Tzonev & al. 2009 [*Pruno tenellae-Syringion* Jovan.1979]; So-

potlieva & al. 2016 [*Pruno tenellae-Syringion* (Jovanović 1979) Čarni & al. 2009]; Vassilev & al. 2016 [*Pruno tenellae-Syringion* (Jovanović 1979) Čarni & al. 2009]; Grigorov & al. 2021 [*Pruno tenellae-Syringion* Jovanović ex Čarni & al. 2009]

**Alliance *Eryngio campestris-Paliurion spinae-christi*** (Jovanović 1985) Matevski & al. 2008

Sub-Mediterranean thermophilous šibljak.

## HERBACEOUS AND DWARF SHRUB VEGETATION

### High montane grasslands and heaths

#### Class *Carici rupestris-Kobresietea bellardii* Ohba 1974

Zonal vegetation of the highest mountains developed on base rich substrates in the alpine range.

Roussakova 2000; Tzonev & al. 2009

#### Order *Oxytropido-Elynetalia* Albrecht 1969

Relict tundra in the alpine belt of the highest mountains.

Roussakova 2000 [*Elynetalia* Oberd. 1937]; Tzonev & al. 2009;

**Alliance *Oxytropido-Elynion myosuroidis*** Br.-Bl. 1950

Graminoid tundra of the alpine belt in the highest mountains.

Simon 1958 [*Oxytropidi-Elynion* Br.-Bl. 1948]; Roussakova 2000 [*Oxytropido-Elynion* Br.-Bl.1949]; Tzonev & al. 2009 [*Oxytropido-Elynion* Br.-Bl. (1948) 1949]

**Alliance *Leontopodio nivalis-Elynion myosuroidis*** (Blasi & al. 2003) Di Pietro et Mucina in Chytrý & al. 2015

Graminoid tundra on the top of alpine belt of the highest mountains.

#### Class *Loiseleurio procumbentis-Vaccinietea* Eggler ex Schubert 1960

Relic alpine acidophilous dwarf heath of the highest mountains.

Roussakova 2000; Pedashenko & al. 2015; Vassilev & al. 2016

**Order *Rhododendro ferruginei-Vaccinietalia*** Br.-Bl. in Br.-Bl. et Jenny 1926

Relic acidophilous dwarf-heath mountain tundra in the subalpine and alpine belts of the mountain ranges.

Roussakova 2000; Pedashenko & al. 2015; Vassilev & al. 2016

**Alliance *Loiseleurio procumbentis-Vaccinion*** Br.-Bl. in Br.-Bl. et Jenny 1926

Relic alpine silicicolous dwarf heath in wind-exposed habitats of the high mountains.

Roussakova 2000

**Alliance *Rhododendron myrtifolii*** de Foucault ex Theurillat et Mucina in Mucina & al. 2016

Relic subalpine and alpine acidophilous chionophilous dwarf

heath of Rila and Stara Planina Mts.

**Order *Vaccinio microphylli-Juniperetalia nanae*** Rivas-Mart. et M. Costa 1998

Low juniper scrub in the supramontane to subalpine belts of the highest mountains.

**Alliance *Juniperion nanae*** Br.-Bl. in Br.-Bl. & al. 1939  
Silicolous low juniper scrub of the mountain ranges.  
Pedashenko & al. 2015; Vassilev & al. 2016

**Class *Mulgedio-Aconitetea* Hadač et Klika in Klika et Hadač 1944**

Tall-herb vegetation in nutrient-rich habitats moistened and fertilized by percolating water at high altitudes.

Roussakova 2000 [*Betulo-Adenostyletea* Br.-Bl. Et Tx. 1943]; Tzonev & al. 2009; Pedashenko & al. 2015; Velev & al. 2016; Gavrilova & Vassilev 2021; Nazarov & al. 2022; Grigorov & al. 2022b

**Order *Adenostyletalia alliariae*** Br.-Bl. 1930

Tall-herb vegetation on fertile soils at high altitudes.

Horvat & al. 1937; Michalik 1990; Roussakova 2000; Tzonev & al. 2009

**Alliance *Adenostylion alliariae*** Br.-Bl. 1926 nom. cons.

Tall-herb vegetation on siliceous substrates at high altitudes.  
Michalik 1990; Grigorov & al. 2022b

**?Alliance *Dryopterido filicis-maris-Athyrium distentifolii***

(Holub ex Šykora et Štursa 1973) Jenik & al. 1980  
Fern-rich vegetation on fertile soils at high altitudes.

**Alliance *Cirsion appendiculati*** Horvat & al. 1937

Tall-herb vegetation on acidic soils along mountain streams and water springs at high altitudes.

Horvat & al. 1937; Horvat & al. 1974; Roussakova 2000; Tzonev & al. 2009; Velev & al. 2016; Grigorov & al. 2022b

**Order *Calamagrostietalia villosae*** Pawłowski & al. 1928

Tall-grass and herb-rich vegetation on deep acidic and calcareous soils.

Pedashenko & al. 2015

**?Alliance *Calamagrostion villosae*** Pawłowski & al. 1928

Tall-herb and herb-rich vegetation on deep acidic soils in the subalpine and alpine belts.

**Alliance *Calamagrostion arundinaceae*** (Luquet 1926) Oberd. 1957

Tall-grass and herb-rich vegetation on dry acidic soils in the subalpine and alpine belt.

Pedashenko & al. 2015

**Order *Petasito-Chaerophylletalia*** Morariu 1967

Tall-herb vegetation on nutrient-rich soils along mountain streams.

Gavrilova & Vassilev 2021; Nazarov & al. 2022

**Alliance *Petasion officinalis*** Sillinger 1933

Tall-herb vegetation on raw alluvia of streams in the hilly regions and mountain areas.

Gavrilova & Vassilev 2021; Nazarov & al. 2022; Grigorov & al. 2022b

**Order *Senecioni rupestris-Rumicetalia alpini*** Mucina et Karner in Mucina & al. 2016

Tall-herb vegetation on nutrient-rich soils in the mountain areas with anthropogenic influence.

Tzonev & al. 2009 [*Rumicetalia alpini* Mucina in Karner et Mucina 1993]

**Alliance *Rumicion alpini*** Scharfetter 1938

Tall-herb vegetation on nutrient-rich soils in the mountain areas with anthropogenic influence.

Roussakova 2000; Tzonev & al. 2009;

**Class *Juncetea trifidi* Hadač in Klika et Hadač 1944**

Rush swards on siliceous substrates in the alpine belt.

Simon 1958 [*Caricetea curvulae* Br.-Bl. 1948]; Horvat & al. 1974 [*Caricetea curvulae*]; Michalik 1990 [*Caricetea curvulae*]; Roussakova 2000; Velev & Apostolova 2009; Tzonev & al. 2009; Pedashenko & al. 2015

**Order *Caricetalia curvulae*** Br.-Bl. in Br.-Bl. et Jenny 1926

Alpine and subalpine silicolous swards of the mountain ranges.

Horvat & al. 1937; Horvat 1954

**Alliance *Caricion curvulae*** Br.-Bl. 1925

Alpine sedge swards on siliceous substrates.

**?Alliance *Juncion trifidi*** Krajina 1933

Alpine rush swards on siliceous substrates.

**Order *Festucetalia spadiceae*** Barbero 1970

Subalpine and alpine acidophilous species-rich grasslands.

Tzonev & al. 2009

**Alliance *Nardion strictae*** Br.-Bl. 1926

Mat-grass chionophilous swards in the subalpine and alpine belts.

Meshinev & al. 2005; Vassilev & al. 2014

**Alliance *Potentillo ternatae-Nardion*** Simon 1958

Oligotrophic mat-grass swards of mountain ranges.

Simon 1958; Horvat & al. 1974; Roussakova 2000; Velev & Apostolova 2008\*; Tzonev & al. 2009; Grigorov & al. 2022b

**Order *Seslerietalia comosae*** Simon 1958

Alpine and subalpine silicolous grasslands.

Horvat 1954 [*Seslerietalia*]; Simon 1958; Horvat & al. 1974; Michalik 1990; Roussakova 2000; Velev & Apostolova 2009; Tzonev & al. 2009; Pedashenko & al. 2015

**Alliance *Poion violaceae*** Horvat & al. 1937

Alpine and subalpine silicicolous grasslands on deep acidic soils.

Horvat & al. 1937; Simon 1958; Horvat & al. 1974; Michalik 1990; Roussakova 2000; Tzonev & al. 2009; Pedashenko & al. 2015

**Alliance *Seslerion comosae*** Horvat & al. 1937

Alpine and subalpine silicicolous grasslands on deep acidic soils in wind-exposed habitats.

Horvat & al. 1937; Simon 1958; Horvat & al. 1974; Michalik 1990; Roussakova 2000; Velev & Apostolova 2009; Tzonev & al. 2009

#### **Class *Elyno-Seslerietea* Br.-Bl. 1948**

Alpine and subalpine calcicolous swards.

Simon 1958; Horvat & al. 1974; Tzonev & al. 2009\*; Karakiev & Tzonev 2011

#### **Order *Onobrychido-Seslerietalia*** Horvat 1960

Alpine and subalpine calcicolous tussock grasslands.

Horvat & al. 1974; Karakiev & Tzonev 2011

**Alliance *Anthyllido-Seslerion klasterskyi*** Simon 1958

Alpine tussock grasslands on limestone in the mountains.

Simon 1958; Karakiev & Tzonev 2011 (*Edraiantho-Seslerion*)

**Alliance *Seslerio-Festucion xanthinae*** Horvat in Horvat & al. 1974

Subalpine fescue grasslands on shallow skeletal soils over limestone.

**?Alliance *Seslerion nitidae*** Horvat 1936

Subalpine calcicolous tussock grasslands.

#### **Temperate grasslands and heaths**

#### **Class *Calluno-Ulicetea* Br.-Bl. et Tx. ex Klika et Hadač 1944**

Heath on acidic nutrient-poor soils in the hilly regions and mountains.

Velev & Apostolova 2009; Pedashenko & al. 2013; Vassilev & al. 2014

#### **Order *Vaccinio myrtilli-Genistetalia pilosae*** Schubert ex Passarge 1964

Heath of cold, subcontinental regions.

**?Alliance *Euphorbio-Callunion*** Schubert ex Passarge 1964

Low-altitude heath of the temperate continental regions.

**Alliance *Bruckenthalion spiculifoliae*** Horvat 1949

High mountain dwarf heath on siliceous substrates.

Dimitrov & al. 2004a [*Junipero-Bruckenthalion* (Horvat 1949) Boşcaiu 1971]

#### **Class *Nardetea strictae* Rivas Goday et Borja Carbonell in Rivas Goday et Mayor Lopez 1966 nom. cons.**

Mat-grass swards on nutrient-poor soils at low and mid-altitudes.

Simon 1958 [*Nardo-Callunetea* Preisg. 1949]; Horvat & al. 1974 [*Nardo-Callunetea*]

#### **Order *Nardetalia strictae*** Preisling 1950

Mat-grass swards on nutrient-poor soils at low and mid-altitudes.

Simon 1958 [*Nardetalia* (Oberd. 1949) Preisg.1949]; Horvat & al. 1974; Pedashenko & al. 2013

**Alliance *Violion caninae*** Schwickerath 1944

Oligotrophic pastures at low and mid-altitudes.

Pedashenko & al. 2013; Grigorov & al. 2022b

**?Alliance *Nardo-Agrostion tenuis*** Sillinger 1933

Mat-grass dry pastures in the submontane to subalpine belts.

**Alliance *Potentillo montenegrinae-Festucion paniculatae*** Redžić ex Čarni et Mucina 2015

Subalpine tussock grasslands on decalcified deep calcareous soils.

#### **Class *Koelerio-Coryneporetea canescentis* Klika in Klika et Novák 1941**

Dry grasslands on sandy soils.

Tzonev & al. 2009

#### **Order *Festucetalia vaginatae*** Soó 1957

Fescue sandy steppes in the forest steppe and steppe zones.

Tzonev & al. 2009

**Alliance *Festucion vaginatae*** Soó 1929

Pannonian subcontinental fescue sandy steppes.

Tzonev & al. 2009

#### **Class *Sedo-Scleranthetea* Br.-Bl. 1955**

Pioneer herb-rich vegetation on shallow soils on rocky outcrops.

Mucina, Kolbek 1989; Pavlov & al. 2006 [*Koelerio-Coryneporetea* Klika in Klika et Novak 1941]; Vassilev & Gavrilova 2015 [*Koelerio-Coryneporetea* Klika in Klika et Novak 1941]; Sopotlieva & al. 2016 [*Koelerio-Coryneporetea* Klika in Klika & Novák 1941]; Grigorov & al. 2021b

#### **Order *Sedo-Scleranthetalia* Br.-Bl. 1956**

Pioneer herb-rich vegetation on shallow soils on rocky outcrops.

Mucina, Kolbek 1989; Vassilev & Gavrilova 2015; Sopotlieva & al. 2016 [*Trifolio arvensis-Festucetalia oviniae* Moravec



1967]

**Alliance *Sedo albi-Veronicion dillenii*** Korneck 1974

Thermophilous therophyte- and geophyte-rich vegetation on stable siliceous rocks and rock fragments.

?**Alliance *Sedo-Scleranthion*** Br.-Bl. et Richard 1950

Pioneer vegetation on acidic shallow soils on siliceous rocky outcrops.

?**Alliance *Hyperico perforati-Scleranthion perennis*** Moravec 1967

Silicolous meso-xerophytic swards on shallow skeletal soils.

?**Alliance *Scabioso-Trifolion dalmatici*** Horvatić et N. Randelović in N. Randelović 1977

Open swards on shallow soils over siliceous rocky outcrops.

**Order *Thero-Airetalia*** Rivas Goday 1964

Pioneer vegetation on acidic shallow soils.

**Alliance *Thero-Airion*** Tx. ex Oberd. 1957

Pioneer vegetation on acidic shallow soils.

Tzonev & al. 2009; Sopotlieva & Apostolova 2014

**Order *Alyso-Sedetalia*** Moravec 1967

Pioneer therophyte and stonecrop swards on calcareous shallow skeletal soils and base-rich sands in temperate climatic regions.

Pavlov & al. 2006; Tzonev & al. 2009

**Alliance *Alyso alyssoidis-Sedion*** Oberd. et T. Müller in T. Müller 1961

Thermophilous vegetation on calcareous rocky substrates.

Mucina & Kolbek 1989; Pavlov & al. 2006; Tzonev & al. 2009;

Grigorov & al. 2021b

(!)**Alliance *Bassio laniflorae-Bromion tectorum*** Borhidi 1996 nom. cons.

Annual open swards on base-rich sands or sandy substrates.

Valcheva & al. 2021

**Class *Trifolio-Geranietea sanguinei*** T. Müller 1962

Heterogenic thermophilous forest fringe vegetation.

Dimitrov et al 2004a; Tzonev & al. 2009; Velev & al. 2010, 2016; Pedashenko & al. 2015; Sopotlieva & al. 2016; Vassilev & al. 2016

**Order *Origanetalia vulgaris*** T. Müller 1962

Meso-subxerophytic fringe and tall-herb vegetation on nutrient-poor but base-rich soils.

Dimitrov & al. 2004a; Tzonev & al. 2009; Velev & al. 2010; Sopotlieva & al. 2016

**Alliance *Trifolion medii*** T. Müller 1962

Meso-subxerophytic fringe vegetation on nutrient-poor but base-rich soils at lower altitudes.

Meshinev & al. 2005; Velev & al. 2010, 2016

**Alliance *Geranion sanguinei*** Tx. in T. Müller 1962

Xerophilous fringe and tall-herb vegetation.

Dimitrov & al. 2004a; Tzonev & al. 2009

**Alliance *Lathyro laxiflori-Trifolion velenovskyi*** (Čarni & al. 2000) Čarni 2005

Subxerophilous fringe vegetation.

**Order *Melampyro-Holcetalia mollis*** Passarge in Theurillat & al. 1995

Meso-xerophytic fringe and tall-herb on acidic soils.

Pedashenko & al. 2015; Vassilev & al. 2016

?**Alliance *Melampyrion pratensis*** Passarge 1979

Meso-xerophytic forest-edge communities on acidic soils.

**Class *Molinio-Arrhenatheretea*** Tx. 1937

Mesophytic meadows, pastures and tall-herb meadow fringes on fertile deep soils at low and mid-altitudes (seldom also at high altitudes).

Horvat & al. 1974, 1974\* [*Plantaginetea majoris*]; Dimitrov 2002; Pavlov & Dimitrov 2004; Hájek & al. 2005; Apostolova & Meshinev 2006; Pavlov & al. 2006; Apostolova & al. 2007; Tzonev 2009a; 2009a [*Plantaginetea majoris* Tuxen ex Preising in Tuxen 1950], 2009b; Sopotlieva 2009b; Velev & al. 2010; 2011b; Pachedjieva 2011; Tzonev & al. 2009, 2013; Vassilev & al. 2014; Velev & Vassilev 2014; Vassilev & al. 2016; Grigorov & al. 2021b, 2022b;

**Order *Arrhenatheretalia elatioris*** Tx. 1931

Meadows and pastures on well-drained mineral soils at low and mid-altitudes.

Horvat & al. 1974; Dimitrov 2002; Pavlov & Dimitrov 2004; Apostolova & Meshinev 2006; Pavlov & al. 2006; Tzonev & al. 2009, 2009 [*Plantagini-Prunelletalia* Ellmauer et Mucina in Mucina & al. 1993]; Velev & al. 2010, 2011b; Vassilev & al. 2014, 2016; Velev 2018; Grigorov & al. 2022b

**Alliance *Arrhenatherion elatioris*** Luquet 1926

Mesic meadows on mineral-rich soils in the lowlands and mid-altitudes.

Horvat & al. 1974; Pavlov & Dimitrov 2004; Meshinev & al. 2005; Pavlov & al. 2006; Apostolova & al. 2007; Tzonev & al. 2009; Velev & al. 2010; Vassilev & al. 2014; Velev & Vassilev 2014; Velev 2018; Grigorov & al. 2022b

**Alliance *Cynosurion cristati*** Tx. 1947

Mesic pastures on well-drained mineral-rich soils at low and mid-altitudes.

Dimitrov 2002; Meshinev & al. 2005; Pavlov & al. 2006; Apos-

- tolova & Meshinev 2006; Apostolova & al. 2007; Tzonev & al. 2009; Velev & al. 2010, 2011a, 2011b; Velev & Vassilev 2014; Vassilev & al. 2014, 2016; Velev 2018; Grigorov & al. 2022b
- Alliance *Alchemillo-Ranunculion repentis*** Passarge 1979  
Slightly trampled herb-rich grasslands in shaded habitats.  
Pavlov & al. 2006 [*Plantagini-Prunellion* Eliáš 1980]; Tzonev & al. 2009 [*Plantagini-Prunellion* Eliáš 1980]
- ?Alliance *Rumicion thrysiflori*** Micevski 1994  
Mesic mown meadows on mineral-rich soils.
- Order *Poo alpinae-Trisetetalia*** Ellmauer et Mucina 1993  
Mesic meadows and pastures in the mountain ranges.
- Alliance *Poion alpinae*** Gams ex Oberd. 1950  
Pastures of fertile soils in the subalpine belt  
Meshinev & al. 2005; Apostolova & al. 2007
- Order *Molinietalia caeruleae*** Koch 1926  
Wet meadows on mineral and peaty soils.  
Dimitrov 2002; Hájek & al. 2005; Tzonev 2009a, 2009a [*Agrostietalia stoloniferae* Oberdorfer in Oberdorfer & al. 1967], 2009b; Tzonev & al. 2009, 2013; Pachedjieva 2011; Grigorov & al. 2021b, 2022b
- Alliance *Molinion caeruleae*** Koch 1926  
Meadows on temporarily wet soils at low altitudes.  
Hájek & al. 2008b; Tzonev & al. 2013; Grigorov & al. 2021b, 2022b;
- Alliance *Calthion palustris*** Tx. 1937  
Wet meadows on mineral soils at mid- and high altitudes.  
Dimitrov 2002; Hájek & al. 2005, 2008b; Tzonev & al. 2009; Pachedjieva 2011
- Alliance *Deschampsion cespitosae*** Horvatić 1930  
Temporarily wet meadows on heavy soils in floodplains and hilly regions in the forest and forest-steppe zones.  
Horvat & al. 1974; Hájek & al. 2008b; Tzonev & al. 2013
- Order *Trifolio-Hordeetalia*** Horvatić 1963  
Wet meadows on gleyic carbonate-rich soils of the river floodplains.  
Horvat & al. 1974; Hájek & al. 2008b; Sopotlieva 2009b; Tzonev & al. 2009
- ?Alliance *Molinio-Hordeion secalini*** Horvatić 1934  
Sub-Mediterranean wet meadows.
- Alliance *Trifolion resupinati*** Micevski 1957  
Wet meadows of sub-Mediterranean regions.  
Horvat & al. 1974; Hájek & al. 2008b; Sopotlieva 2009b; Tzonev & al. 2009; Eliáš & al. 2013
- Order *Filipendulo ulmariae-Lotetalia uliginosi*** Passarge 1975  
Tall-herb wet meadow fringe vegetation on mineral soils.  
Grigorov & al. 2021b
- Alliance *Filipendulo-Petasition*** Br.-Bl. ex Duvigneaud 1949  
Tall-herb fringe wet meadow vegetation on neutral and slightly basic mineral soils in the submontane and montane belts.
- ?Alliance *Rumicion balcanici*** Lakušić ex D. Lakušić & al. 2015  
Tall-herb fringe wet meadow vegetation on neutral and slightly basic mineral soils in the submontane and montane belts.
- Alliance *Veronico longifoliae-Lysimachion vulgaris*** (Passarge 1977) Bal.-Tul. 1981  
Tall-herb fringe wet meadow vegetation on neutral and slightly basic mineral soils in the lowland and hilly regions.  
Tzonev 2009a, 2009b; Tzonev & al. 2009
- Alliance *Filipendulion ulmariae*** Segal ex Westhoff et Den Held 1969  
Tall-herb fringe wet meadow vegetation on acidic mineral soils.  
Grigorov & al. 2021b
- Alliance *Mentho longifoliae-Juncion inflexi*** T. Müller et Görs ex de Foucault 2009  
Tall-herb temporarily flooded nutrient-rich meadow fringes in riparian and alluvial habitats.
- Order *Potentillo-Polygonetalia avicularis*** Tx. 1947  
Temporarily flooded and heavily grazed nutrient-rich meadows and pastures.  
Tzonev & al. 2009
- Alliance *Potentillion anserinae*** Tx. 1947  
Temporarily flooded and heavily grazed nutrient-rich pastures experiencing variable wet-dry or brackish-fresh alternating conditions.  
Tzonev & al. 2009
- Alliance *Loto tenuis-Trifolion fragiferi*** Westhoff et Den Held ex de Foucault 2009  
Temporarily flooded heavily grazed nutrient-rich grasslands and herblands on subsaline soils.
- Alliance *Trifolion maritimi*** Br.-Bl. ex Br.-Bl. & al. 1952  
Temporarily flooded heavily grazed nutrient-rich grasslands and herblands on subsaline soils in southern regions.  
Tzonev & al. 2009 [*Trifolio-Cynodontion* Br.-Bl. et O. Bolós 1957]
- Class *Festuco-Brometea*** Br.-Bl. et Tüxen ex Soó 1947  
Dry grassland and steppe vegetation.  
Horvat & al. 1974; Pavlov & Dimitrov 2004; Apostolova-Stoyanova & al. 2005; Apostolova & Meshinev 2006; Palvov & al. 2006; Tzonev & al. 2006a, 2009, 2013b, 2019b; Apostolova & al. 2008; Sopotlieva 2009b; Pedashenko & al. 2009, 2010, 2013,

2015; Tzonev 2009b, 2013; Todorova & Tzonev 2010; Vassilev & al. 2012, 2014; Sopotlieva & Apostolova 2014; Velev & Vassilev 2014; Vassilev & Gavrilova 2015; Sopotlieva & al. 2016; Grigorov & al. 2021b, 2022b

**Order *Brachypodietalia pinnati*** Korneck 1974 nom. cons.

Meso-xerophytic grasslands on deep calcareous soils.

Pavlov & Dimitrov 2004 [*Brometalia erecti* Koch 1926]; Pedashenko & al. 2013

**Alliance *Cirsio-Brachypodion pinnati*** Hadač et Klika in Klika et Hadač 1944

Meso-xerophytic basiphilous grasslands.

Pedashenko & al. 2010, 2013; Vassilev & al. 2014; Velev & Vassilev 2014; Vassilev & al. 2012; Grigorov & al. 2021b [*Brachypodion pinnati*]

**Alliance *Chrysopogono-Danthonion calycinae*** Kojić 1959

Dry grasslands on deep soils over siliceous bedrocks in the hilly regions up to low mountain levels.

Horvat & al. 1974; Meshinev & al. 2005; Apostolova & Meshinev 2006; Tzonev & al. 2009; Vassilev & al. 2012; Pedashenko & al. 2013; Velev & Vassilev 2014; Grigorov & al. 2021b, 2022b

**Order *Festucetalia valesiaca*** Soó 1947

Steppes and rocky steppic grasslands on deep soils in the steppe and forest-steppe zones.

Horvat 1954 [*Festucetalia*]; Horvat & al. 1974; Apostolova-Stoyanova & al. 2005; Apostolova & Meshinev 2006; Tzonev & al. 2006a, 2009, 2009 [*Koelerio-Phleetalia pleoides* Korneck 1974], 2019b; Tzonev 2009b, 2013; Sopotlieva 2009b; Todorova & Tzonev 2010; Vassilev & al. 2014; Sopotlieva & Apostolova 2014; Vassilev & Gavrilova 2015

**Alliance *Festucion valesiaca*** Klika 1931 nom. cons.

Steppe fescue grasslands on deep soils.

Horvat & al. 1974 [*Festucion rupicolae*]; Meshinev & al. 2005; Apostolova & Meshinev 2006; Apostolova & al. 2008; Tzonev 2009b, 2013; Tzonev & al. 2009, 2019b [*Festucion rupicolae* Soó 1940]; Sopotlieva 2009b; Vassilev & al. 2012, 2014; Sopotlieva & Apostolova 2014; Velev & Vassilev 2014; Vassilev & Gavrilova 2015

**Alliance *Stipion lessingiana*** Soó 1947

Dry feather-grass and fescue steppes on deep soils.

Meshinev & al. 2005

**Alliance *Artemisio-Kochion*** Soó 1964

Relict tardiglacial xerophytic loess steppes.

Tzonev 2009b [*Agropyro-Kochion* Soó 1931], 2013; Tzonev & al. 2009

**Order *Stipo pulcherrimae-Festucetalia pallentis*** Pop 1968

nom. cons.

Xerophilous open steppic grasslands on shallow rocky calcareous and siliceous substrates.

Pavlov & al. 2006 [*Seslerietalia rigidae* Gergely 1967]; Tzonev & al. 2009, 2009 [*Seslerietalia rigidae* Gergely 1967]; Pedashenko & al. 2013; Sopotlieva & Apostolova 2014; Sopotlieva & al. 2016

**Alliance *Chrysopogono-Festucion dalmaticae*** Borhidi 1996

Xerophilous rocky steppic grasslands on calcareous substrates.

**Alliance *Saturejion montanae*** Horvat in Horvat & al. 1974

Xerophilous steppic grasslands on rocky calcareous substrates.

Horvat & al. 1974; Apostolova-Stoyanova & al. 2005; Pedashenko & al. 2009; Sopotlieva 2009b; Todorova & Tzonev 2010; Vassilev & al. 2012; Pedashenko & al. 2013; Tzonev 2013; Vassilev & al. 2014; Sopotlieva & Apostolova 2014; Sopotlieva & al. 2016; Matevski & al. 2018; Tzonev & al. 2019b; Grigorov & al. 2021b, 2022b

**Alliance *Pimpinello-Thymion zygotidi*** Dihoru et Donița 1970

Xerophilous steppic dwarf-shrub rich grasslands on rocky calcareous substrates.

Apostolova & Meshinev 2006; Tzonev & al. 2006a

**Alliance *Seslerion rigidae*** Zólyomi 1936

Relict xerophilous steppic grasslands on calcareous substrates.

Horvat & al. 1974; Pavlov & al. 2006; Tzonev & al. 2009

**Order *Artemisio albae-Brometalia erecti*** Ubaldi ex Dengler et

Mucina in Mucina & al. 2009

Meso-xerophytic basiphilous open grasslands.

**Alliance *Xerobromion erecti*** Zoller 1954

Meso-xerophytic basiphilous open grasslands.

Pavlov & Dimitrov 2004 [*Xerobromion* (Br.-Bl. Et Moor 1938) Moravec in Holub, Hejini, Moravec et Neuhausl 1967]

**Order *Scorzonetalia villosae*** Kovačević 1959

Dry steppic sub-Mediterranean pastures.

Tzonev & al. 2009 [*Scorzonero-Chrysopogonetalia* Horvatić et Horvat 1958]

**?Alliance *Chrysopogono grylli-Koelerion splendidis*** Horvatić 1973

Sub-Mediterranean rocky grasslands on shallow calcareous soils.

Tzonev & al. 2009 [*Chrysopogono-Saturejion* Horvat et Horvatić in Horvatić 1934]

**Order *Astragalo onobrychidis-Potentilletalia*** Micevski 1971

Dry sub-Mediterranean montane steppic grasslands on calcareous substrates.

Tzonev & al. 2013b; Pedashenko & al. 2015

?Alliance *Saturejo-Thymion* Micevski 1971

Dry sub-Mediterranean montane steppic grasslands on calcareous substrates.

**Order *Halacsyetalia sendtneri*** Ritter-Studnička 1970

Ultramafic and silicicolous xeric rocky grasslands.

Alliance *Alysson heldreichii* Bergmeier & al. 2009

Ultramafic xeric rocky grasslands.

Tzonev & al. 2013b

### Halophytic and subhalophytic grasslands

**Class *Festuco-Puccinellietea* Soó ex Vicherek 1973**

Saline steppic grasslands.

Tzonev & al. 2008, 2009; Tzonev 2009b, 2013; Sopotlieva 2009b

**Order *Puccinellietalia* Soó 1947**

Meso-xerophytic saline pastures.

Horvat & al. 1974\*; Tzonev & al. 2008, 2009; Tzonev 2009b; Sopotlieva 2009b

?Alliance *Festucion pseudovinae* Soó 1933

Pontic-Pannonian saline steppic pastures.

Alliance *Puccinellion limosae* Soó 1933

Hypersaline open grasslands.

Horvat & al. 1974\*; Meshinev & al. 2005; Tzonev & al. 2008, 2009; Tzonev 2009b; Sopotlieva 2009b

Alliance *Puccinellion convolutae* Micevski 1965

Relict saline grasslands on edges of inland salt pans.

**Order *Scorzonero-Juncetalia gerardi*** Vicherek 1973

Wet subsaline meadows and pastures.

Alliance *Juncion gerardi* Wendelberger 1943

Wet subsaline regularly inundated meadows and pastures.

Horvat & al. 1974\*; Eliáš & al. 2013

Alliance *Beckmannion eruciformis* Soó 1933

Wet subsaline regularly inundated meadows on heavy clayey soils.

Horvat & al. 1974\*; Eliáš & al. 2013

**Class *Crypsietea aculeatae* Vicherek 1973**

Pioneer ephemeral dwarf-grass vegetation in periodically flooded saline habitats.

**Order *Crypsietalia aculeatae*** Vicherek 1973

Pioneer ephemeral dwarf-grass vegetation in periodically flooded saline habitats.

Tzonev & al. 2008, 2009c

Alliance *Cypero-Spergularion salinae* Slavnić 1948

Pioneer ephemeral dwarf-grass vegetation in periodically

flooded saline habitats.

Tzonev & al. 2008, 2009c

?Alliance *Heleochloion schoenoidis* Br.-Bl. ex Rivas Goday 1956

Pioneer ephemeral dwarf-grass vegetation in periodically flooded saline habitats in the (sub)Mediterranean regions.

### Mediterranean grasslands and heaths

**Class *Cisto-Lavanduletea stoechadis* Br.-Bl. in Br.-Bl. & al. 1940**

Mediterranean scrub on acidic siliceous and ultramafic substrates.

Kunev & al. 2020

**Order *Lavandulo stoechadis-Hypericetalia olympici*** Mucina in Mucina & al. 2016

Eastern Mediterranean garrigue and phrygana on acidic siliceous and ultramafic substrates.

Kunev & al. 2020

?Alliance *Hyperico olympici-Cistion cretici* (Oberd. 1954) R. Jahn et Bergmeier in Mucina & al. 2009

Thermo-meso-Mediterranean silicicolous phrygana.

Alliance *Genistion lydiae* Kunev & al. 2020

Low-growing shrub communities developed on acidophilous rocky sites, eroded places with poor shallow soils.

Kunev & al. 2020

**Class *Stipo giganteae-Agrostietea castellanae* Rivas-Mart. & al. 1999**

Sub-Mediterranean perennial acidophilous oligo-mesotrophic grasslands.

**Order *Armerietalia rumelicae*** V. Randelović et N. Randelović in V. Randelović et Zlatković ex Mucina et Čarni in Di Pietro & al. 2015

Sub-Mediterranean silicicolous perennial grasslands.

Alliance *Armerio rumelicae-Potentillion* Mitsevski 1978

Supratemperate sub-Mediterranean silicicolous perennial grasslands.

Pedashenko & al. 2013, 2015

?Class *Poetea bulbosae* Rivas Goday et Rivas-Mart. In Rivas-Mart. 1978

Mediterranean seasonal perennial and ephemeroïd pastures .

?Order *Poetalia bulbosae* Rivas Goday et Rivas-Mart. in Rivas Goday et Ladero 1970

Mediterranean seasonal perennial and ephemeroïd pastures.

?Alliance *Romuleion* Oberd. 1954

Seasonal perennial pastures on acidic substrates.

**Class *Helianthemetea guttati* Rivas Goday et Rivas-Mart. 1963**

Mediterranean and sub-Mediterranean annual low-grown ephemeral herb- and grass-rich vegetation on acidic substrates.

Sopotlieva 2009a, 2009b; Tzonev & al. 2009; Sopotlieva & Apostolova 2014

**Order *Helianthemetalia guttati* Br.-Bl. in Br.-Bl. & al. 1940**

Mediterranean and sub-Mediterranean inland ephemeral vegetation on nutrient-poor shallow acidic soils.

Sopotlieva 2009a, 2009b; Tzonev & al. 2009; Sopotlieva & Apostolova 2014

**Alliance *Trifolion cherleri* Micevski 1972**

Sub-Mediterranean silicolous therophytic swards.

Sopotlieva & Apostolova 2007, Sopotlieva 2009a, 2009b, Tzonev & al. 2009; Sopotlieva & Apostolova 2014

**?Class *Stipo-Trachynietea distachyae* S. Brullo in S. Brullo & al. 2001**

**?Order *Ptilostemonea stellati-Vulpietalia ciliatae* Mucina ined.**

Mediterranean therophyte-rich dwarf-herb and low-grass communities on calcareous substrates

**?Alliance *Xeranthemion annui* Oberd. 1954**

Therophyte-rich calciphilous swards in abandoned fields.

**?Class *Trifolio anatolici-Polygonetea arenastri* Quézel 1973**

Oro-Mediterranean, slightly chionophilous mat-grass swards.

**?Order *Trifolietalia parnassii* Quézel 1964**

Oro-Mediterranean slightly chionophilous mat-grass swards.

**?Alliance *Trifolion parnassii* Quézel 1964**

Oro-Mediterranean slightly chionophilous mat-grass swards.

**Coastal sand dune and sea-cliff vegetation**

**?Class *Saginetea maritimae* Westhoff & al. 1962**

Ephemeral vegetation in small disturbed saline habitats often characterized by some sand deposition.

Tzonev & al. 2009\*

**?Order *Frankenietalia pulverulentae* Rivas-Mart. Ex Castroviejo et Porta 1976**

Ephemeral vegetation on clayey and silty saline soils.

**?Alliance *Pholiuro-Spergularion* Pignatti 1952**

Ephemeral aerohaline vegetation on fine-grained soils.

**Class *Crithmo-Staticetea* Br.-Bl. in Br.-Bl. & al. 1952**

Rupicolous vegetation of salt-sprayed coastal cliffs.

Horvat & al. 1974 [*Crithmo-Limonietea*]; Tzonev & al. 2009

**Order *Crithmo-Staticetalia* Molinier 1934**

Rupicolous vegetation of salt-sprayed cliffs.

Tzonev & al. 2009

**Alliance *Crithmo-Staticion* Molinier 1934**

Rupicolous dwarf-herb vegetation of salt-sprayed limestone cliffs.

Tzonev & al. 2009

**?Alliance *Kochio prostratae-Limonion meyeri* Korzhenevskii 1987**

Rupicolous herb-rich vegetation on salt-sprayed rock cliffs.

**Class *Cakiletea maritimae* Tx. et Preising in Tx. ex Br.-Bl. et Tx. 1952**

Pioneer halo-nitrophilous short-lived vegetation in strandlines of coastal sandy and shingle beaches.

Horvat & al. 1974; Vicherek 1971; Tzonev & al. 2005, 2009

**Order *Thero-Atriplicetalia* Pignatti 1953**

Pioneer halo-nitrophilous strandline vegetation.

Vicherek 1971 [*Euphorbietalia peplis* R.Tx.1950]; Tzonev & al. 2009 [*Euphorbietalia peplis* Tüxen ex Oberd. 1949]

**Alliance *Euphorbion peplidis* Tx. ex Oberd. 1952**

Pioneer halo-nitrophilous Mediterranean strandline vegetation. Vicherek 1971 [*Euphorbion peplis* R.Tx. 1950]; Tzonev & al. 2005, 2009

**Alliance *Cakilion euxinae* Géhu & al. 1994**

Pioneer halo-nitrophilous Black Sea strandline vegetation.

**Class *Ammophiletea* Br.-Bl. et Tx. ex Westhoff & al. 1946**

Perennial grasslands on mobile coastal dunes.

Horvat & al. 1974; Vicherek 1971; Dimitrov & al. 2005; Tzonev & al. 2005, 2009, 2009 [*Honckenyo-Elymetea arenarii* Tüxen 1966]; Marcenò & al. 2018

**Order *Ammophiletalia* Br.-Bl. et Tx. ex Westhoff & al. 1946**

Perennial grasslands on mobile white and embryonic coastal dunes.

Vicherek 1971 [*Elymetalia gigantei* Vicherek 1971]; Horvat & al. 1974 [*Elymetalia gigantei*]; Tzonev & al. 2005, 2009 [*Elymetalia gigantei* Vicherek 1971]; Dimitrov & al. 2005 [*Elymetalia gigantei* Vicherek 1971]

**Alliance *Elymion gigantei* Morariu 1957**

Perennial grasslands on mobile white and embryonic coastal dunes.



Vicherek 1971; Horvat & al. 1974 [*Elymion gigantei*]; Tzonev & al. 2005, 2009; Dimitrov & al. 2005; Marcenò & al. 2018

**Class *Helichryso-Crucianelletea maritimae* Géhu & al. in Sissingh 1974**

**Order *Medicago-Seselietalia tenderiensis* Umanets et V. Solomakha 1999**

Grasslands and dwarf-scrub vegetation on stabilized coastal dunes.

**Alliance *Sileno thymifoliae-Jurineion kilaeae* Géhu et Uslu ex Mucina in Mucina & al. 2016**

Grasslands and dwarf-scrub vegetation on stabilized (grey) dunes.

Tzonev & al. 2005, 2009; Marcenò & al. 2018

**Alliance *Scabiosion ucranicae* Sanda & al. 1980**

Grasslands and dwarf-scrub vegetation on stabilized (grey) dunes.

Dimitrov & al. 2005; Tzonev & al. 2005, 2009; Marcenò & al. 2018

**Vegetation of rocky terrains, rock crevices and screes**

**Class *Adiantetea* Br.-Bl. & al. 1952**

Chasmophytic vegetation in the shaded and water-splashed habitats.

Tzonev & al. 2009\*

**Order *Adiantetalia* Br.-Bl. ex Horvatić 1934**

Chasmophytic vegetation in the shaded and water-splashed habitats.

**Alliance *Adiantion* Br.-Bl. ex Horvatić 1934**

Relict fern-rich chasmophytic communities in shaded and water-splashed habitats.

**Class *Polypodietea* Jurko et Peciar ex Boşcaiu, Gergely et Codoreanu in Raţiu & al. 1966**

Chasmophytic and epiphytic vegetation of fern- and moss-rich communities in crevices and on the surface of rocky cliffs.

**Order *Hypno cupressiformi-Polypodietalia vulgaris* Jurko et Peciar ex Mucina et Theurillat 2015**

Fern- and moss-rich chomophytic, chasmophytic and epiphytic vegetation on shaded rock faces and bark of old trees.

**Alliance *Hypno-Polypodium vulgaris* Mucina 1993**

Fern-rich vegetation of siliceous shaded rock crevices.

**?Order *Anomodonto-Polypodietalia serrati* O. de Bolòs et Vives in O. de Bolòs 1957**

Mediterranean fern- and moss-rich chomophytic and chasmophytic vegetation on shaded rock faces and epiphytic on branch-

es of old trees.

**?Alliance *Polypodium serrati* Br.-Bl. in Br.-Bl. & al. 1952**

Mediterranean fern-rich epilithic communities on shaded rock faces and crevices and epiphytic on branches of old trees.

**Order *Ctenidio-Polypodietalia vulgaris* Jurko et Peciar ex Boşcaiu, Gergely et Codoreanu in Raţiu & al. 1966**

Vegetation of shady calcareous rock faces and crevices at low altitudes.

**Alliance *Moehringion muscosae* Horvat et Horvatić ex Boşcaiu, Gergely et Codoreanu in Raţiu & al. 1966**

Vegetation of shady calcareous rock faces and crevices.

**?Order *Violo biflorae-Cystopteridetalia alpinae* Fernández Casas 1970**

Vegetation of shady calcareous rock faces and crevices at high altitudes.

**?Alliance *Violo biflorae-Cystopteridion alpinae* Fernández Casas 1970**

Vegetation of shady calcareous rock faces and crevices at high altitudes.

**Class *Asplenieta trichomanis* (Br.-Bl. in Meier et Br.-Bl. 1934) Oberd. 1977**

Chasmophytic vegetation of rock crevices and rocky cliffs.

Simon 1958 [*Asplenieta rupestris* Br.-Bl. 1926]; Horvat & al. 1974 [*Asplenieta rupestris*]; Mucina & Kolbek 1989; Mucina & al. 1990; Roussakova 2000 [*Asplenieta rupestris* Br.-Bl. 1934], Tzonev & al. 2009

**Order *Geranio robertiani-Asplenetalia trichomanis* Ferrez ex Mucina ined.**

Chasmophytic vegetation of semi-shaded and sunny rock faces and crevices.

**?Alliance *Asplenio scolopendrii-Geranium robertiani* Ferrez 2010**

Chasmophytic vegetation of semi-shaded and sunny rock faces and crevices.

**Order *Potentilletalia caulescentis* Br.-Bl. in Br.-Bl. et Jenny 1926**

Chasmophytic vegetation of sunny calcareous rock faces and crevices at high altitudes.

Simon 1958; Horvat & al. 1974; Mucina & al. 1990

**?Alliance *Gypsophilion petraeae* Borhidi et Pócs in Borhidi 1958**

Chasmophytic vegetation of calcareous rock faces and crevices in the subalpine belt.

**Order *Moltkeetalia petraeae* Lakušić 1968**

Chasmophytic vegetation of limestone crevices in the montane

to alpine belts.

**Alliance *Edraiantho graminifolii-Erysimion comati*** Mucina & al. 1990

Chasmophytic vegetation of limestone crevices and rock faces in the subalpine and alpine belts.

Mucina & al. 1990; Stešević & al. 2023

**Order *Potentilletalia speciosae*** Quézel 1964

Chasmophytic vegetation of calcareous rocky crevices of the high mountain ranges.

Tzonev & al. 2009

**Alliance *Ramondion nathaliae*** Horvat ex Simon 1958

Chasmophytic vegetation of calcareous rocky crevices in the alpine belt.

Simon 1958; Horvat & al. 1974; Mucina & al. 1990; Tzonev & al. 2009

**Alliance *Asplenion septentrionalis*** Gams ex Oberd. 1938

Fern-rich chasmophytic vegetation of siliceous sunny rock crevices.

**Order *Androsacetalia vandellii*** Br.-Bl. in Meier et Br.-Bl. 1934 corr. Mucina & al. 2016

Chasmophytic vegetation of crevices of siliceous rocks in the mountains.

Horvat 1937 [*Androsacetalia multiflorae* Br.-Bl. 1926]; Simon 1958; Roussakova 2000; Tzonev & al. 2009

**Alliance *Silenion lerchenfeldianae*** Simon 1958

Chasmophytic vegetation of siliceous rock crevices at high altitudes.

Simon 1958; Horvat & al. 1974; Roussakova 2000; Tzonev & al. 2009

**Class *Cymbalario-Parietarietea diffusae*** Oberd. 1969

Thermophilous chasmophytic vegetation of walls.

Mucina, Kolbek 1989 [*Parietarietea judaicae* Rivas-Martinez ex Rivas-Goday 1964]

**Order *Tortulo-Cymbalarietalia*** Segal 1969

Thermophilous chasmophytic vegetation of walls of the winter mild regions.

Tzonev & al. 2009 [*Parietarietalia* Rivas-Mart. in Rivas Goday 1964]

**Alliance *Cymbalario-Asplenion*** Segal 1969

Fern-rich chasmophytic vegetation of sunny walls.

Tzonev & al. 2009

**Class *Thlaspietalia rotundifolii*** Br.-Bl. 1948

Vegetation of scree habitats.

Simon 1958; Mucina & al. 1986; Mucina & al. 1990; Roussakova 2000; Tzonev & al. 2009, 2019b; Gavrilova & Vassilev 2021

**Order *Thlaspietalia rotundifolii*** Br.-Bl. in Br.-Bl. et Jenny 1926  
Alpine and subalpine calcareous scree vegetation.

Simon 1958; Tzonev & al. 2009

**Alliance *Veronico-Papaverion degenii*** Mucina & al. 1990

Alpine communities on marble and limestone screes of Pirin Mt. Mucina & al. 1990; Tzonev & al. 2009 [*Veronico kellererii-Papaverion degenii* Mucina & al. 1990]

**Order *Arabidetalia caeruleae*** Rübél ex Nordhagen 1937

Vegetation of snow-beds on stabilized calcareous alpine screes.

Mucina & al. 1990

**Alliance *Arabidion caeruleae*** Br.-Bl. in Br.-Bl. et Jenny 1926

Vegetation of snow-beds on stabilized calcareous alpine screes.

Mucina & al. 1990 [*Salicion retusae* Horvat 1949]

**Order *Arabido alpinae-Petasitetalia paradoxi*** Mucina et Valchovič ined.

Vegetation of humid calcareous screes and rocks in the montane to subalpine belts.

**?Alliance *Petasition doerfleri*** Lakušić D. Lakušić & al. 2015

Vegetation of humid stable coarse-grained calcareous screes and rocks in the mountains.

**Order *Stipetalia calamagrostis*** Oberd. et Seibert in Oberd. 1977

Vegetation of thermophilous low-altitude calcareous screes.

Gavrilova & Vassilev 2021

**Alliance *Stipion calamagrostis*** Jenny-Lips ex Br.-Bl. 1950

Vegetation of thermophilous low-altitude calcareous screes.

Gavrilova & Vassilev 2021

**Order *Androsacetalia alpinae*** Br.-Bl. in Br.-Bl. Et Jenny 1926

High mountain vegetation of siliceous screes.

Horvat & al. 1937; Simon 1958; Horvat & al. 1974; Tzonev & al. 2009

**Alliance *Androsacion alpinae*** Br.-Bl. in Br.-Bl. et Jenny 1926

Vegetation of siliceous screes in the alpine belt.

Horvat & al. 1937; Simon 1958; Horvat & al. 1974; Tzonev & al. 2009

**Order *Epilobietalia fleischeri*** Moor 1958 nom. cons.

Vegetation of montane to subalpine riverine gravel terraces.

**Alliance *Calamagrostion pseudophragmitae*** Rivas-Martínez & al. 1984

Vegetation of the montane-subalpine riverine gravel terraces.

**Class *Drypidetalia spinosae*** Quézel 1964

Vegetation of scree habitats and pebble alluvia in the sub-Medi-

terranean mountains.

**Order *Drypidetalia spinosae*** Quézel 1964

Montane sub-Mediterranean and oro-Mediterranean scree vegetation.

Tzonev & al. 2009

**Alliance *Silenion marginatae*** Lakušić 1968

Limestone scree vegetation in the montane to subalpine belts.

Tzonev & al. 2009

## AQUATIC VEGETATION

### Saline and brackish waters vegetation

**Class *Zosteretea*** Pignatti 1953

Vegetation of sea-grass meadows on muddy and sandy sub-merged substrates.

Tzonev & al. 2009\*

**Order *Zosteretalia*** Béguinot ex Pignatti 1953

Vegetation of sea-grass meadows of the sandy-muddy sublittoral.

**Alliance *Zosterion marinae*** Br.-Bl. et Tx. ex Pignatti 1953

Vegetation of perennial sea-grass meadows of the sandy-muddy sea sublittoral.

**?Alliance *Nanozosterion noltii*** Den Hartog ex Mucina in Mucina & al. 2016

Vegetation of short-lived sea grass meadows of the sandy-muddy sea sublittoral.

**Class *Ruppiaetea maritimae*** J. Tx. ex Den Hartog et Segal 1964

Submerged rooted herbaceous vegetation of brackish waters.

Tzonev & al. 2009\*

**Order *Ruppiaetalia*** J. Tx. ex Den Hartog et Segal 1964 nom. cons.

Submerged rooted herbaceous vegetation of temperate brackish waters.

**Alliance *Ruppion maritimae*** Br.-Bl. ex Westhoff in Bennema & al. 1943

Submerged rooted herbaceous vegetation of temperate brackish water.

**Class *Therosalicornietea*** Tx. in Tx. et Oberd. 1958

Pioneer vegetation of annual succulent halophytes on edges of the irregularly flooded saline inland waters.

Horvat & al. 1974\* [*Thero-Salicornietea*]; Tzonev & al. 2008, 2009 [*Thero-Salicornietea strictae* Pignatti 1953]; Tzonev 2009b

**Order *Therosalicornietalia*** Pignatti 1952

Pioneer vegetation of annual succulent halophytes on edges of the

irregularly flooded saline inland waters.

Horvat & al. 1974\* [*Thero-Salicornietalia*]; Tzonev & al. 2008, 2009 [*Thero-Salicornietalia strictae* Pignatti 1953]; Tzonev 2009b

**Alliance *Therosalicornion*** Br.-Bl. 1933

Mediterranean pioneer vegetation of annual succulent plants of irregularly flooded saline inland depressions.

Horvat & al. 1974\* [*Thero-Salicornion*]; Tzonev & al. 2008, 2009 [*Thero-Salicornion strictae* Br.-Bl. 1933]; Tzonev 2009b

**Order *Camphorosmo-Salicornietalia*** Borhidi 1996

Hypersaline vegetation dominated by annual succulents on solonchak and solonetz soils of

inland salt pans.

**Alliance *Salicornion prostratae*** Géhu 1992

Vegetation of annual succulent halophytes on solonchak soils in temporarily wet inland salt-pans.

**Alliance *Thero-Camphorosmion annuae*** Vicherek 1973

Hypersaline annual chenopod communities on solonetz soils.

**Class *Juncetea maritimi*** Br.-Bl. in Br.-Bl. & al. 1952

Perennial grasslands and herb-rich vegetation of coastal and inland salt marshes.

Horvat & al. 1974\* [*Asteretea tripolium*]; Tzonev & al. 2008, 2009; Sopotlieva & al. 2020

**Order *Juncetalia maritimi*** Br.-Bl. ex Horvatić 1934

Termophyllous tall-rush saline wetland vegetation.

Tzonev & al. 2008, 2009; Sopotlieva & al. 2020

**Alliance *Juncion maritimi*** Br.-Bl. ex Horvatić 1934

Termophyllous coastal saline rush marsh vegetation under a prolonged flooding regime.

Tzonev & al. 2008, 2009; Sopotlieva & al. 2020

### Freshwater vegetation

**Class *Lemnetea*** O. de Bolòs et Masclans 1955

Free-floating vegetation of standing and relatively nutrient-rich water bodies.

Horvat & al. 1974\*; Kochev & al. 1986 [*Lemnetea Tüxen* 1955]; Tzonev 2009a [*Lemnetea minoris* Tüxen 1955], 2009b; Tzonev & al. 2009, 2019b; Valchev & al. 2012; Georgiev 2021

**Order *Lemnetalia minoris*** O. de Bolòs et Masclans 1955

Free-floating vegetation of standing and relatively nutrient-rich water bodies.

Tzonev 2009a; 2009a [*Lemno-Utricularietalia* Passarge 1978], 2009b; Valchev & al. 2012; Tzonev & al. 2009, 2019b; Georgiev 2021

**Alliance *Lemnion minoris*** O. de Bolòs et Masclans 1955

Free-floating duckweed vegetation of standing and relatively nutrient-rich water bodies.

Tzonev 2009a, 2009b; Valchev & al. 2012, 2012 [*Lemnion trisulcae* Hartog et Segal ex Tuxen et Schwabe-Braun in Tuxen 1974]; Tzonev & al. 2009 [*Lemnion trisulcae* Knap et Stiffers 1962], 2019b [*Lemnion gibbae* R. Tx. et Schwabe-Braun in R. Tx. 1974]; Georgiev 2021 [*Lemnion gibbae* R. Tx. et Schwabe-Braun in R. Tx 1974]

**Alliance *Utricularion vulgaris*** Passarge 1964

Vegetation of free-floating bladderworts in mesotrophic and eutrophic waters.

Tzonev 2009a, Tzonev & al. 2009, 2009 [*Ceratophyllion demersi* Hartog et Segal ex Passarge 1996]; Valchev & al. 2012

**Alliance *Stratiotion*** Den Hartog et Segal 1964

Vegetation of free-floating macrophytes in fairly nutrient-rich shallow waters.

Valchev & al. 2012 [*Ceratophyllion demersi* Hartog et Segal ex Passarge 1996, *Hydrocharition* Rübel ex Klika in Klika & Hadač 1944]

**Class *Potamogetonetea*** Klika in Klika et Novák 1941

Vegetation of rooted floating or submerged macrophytes of stagnant mesotrophic, eutrophic and brackish freshwater bodies and slowly flowing shallow streams.

Horvat & al. 1974 [*Potametea*]; Tzonev & al. 2009, 2019b

**Order *Potamogetonetalia*** Koch 1926

Vegetation of rooted floating or submerged macrophytes of mesotrophic and eutrophic freshwater bodies.

Tzonev & al. 2009, 2019b

**Alliance *Potamogetonion*** Libbert 1931

Vegetation of rooted and floating macrophytes of freshwater bodies at low and mid-altitudes.

Tzonev 2009b; Tzonev & al. 2009 [*Magnopotamion* (W. Koch 1926) Libbert 1931], 2019b [*Potamogetonion pectinati* (Koch 1926) Görs 1977]

**Alliance *Nymphaeion albae*** Oberd. 1957

Vegetation of rooted floating-leaf macrophytes of sheltered nutrient-rich freshwaters.

Tzonev 2009a, 2009b; Tzonev & al. 2009, 2009 [*Parvopotamion* (Vollmar 1947) Hartog et Segal 1964]; Valchev & al. 2012, 2012 [*Parvopotamion* (Vollmar 1947) Hartog et Segal 1964]

**Alliance *Potamogetonion graminei*** Westhoff et Den Held 1969

Vegetation of rooted macrophytes of nutrient-poor shallow

freshwaters at mid-altitudes.

Valchev & al. 2012 [*Potamion polygonifolii* Hartog and Segal 1964]

**Order *Callitricho hamulatae-Ranunculeetalia aquatilis*** Passarge ex Theurillat in Theurillat & al. 2015

Vegetation of rooted macrophytes in shallow and intermittent freshwater streams.

**Alliance *Batrachion fluitantis*** Neuhäusl 1959

Vegetation of rooted macrophytes in shallow moving freshwaters.

**Alliance *Ranunculion aquatilis*** Passarge ex Theurillat in Theurillat & al. 2015

Vegetation of rooted macrophytes in shallow stagnant freshwaters.

**?Order *Zannichellietalia pedicellatae*** Schaminée, Lanjouw et Schipper ex Mucina et Theurillat ined.

Vegetation of rooted macrophytes in meso-eutrophic brackish waters.

**?Alliance *Zannichellion pedicellatae*** Schaminée, Lanjouw et Schipper ex Passarge 1996

Vegetation of rooted macrophytes in meso-eutrophic brackish waters.

**Class *Littorelletea uniflorae*** Br.-Bl. et Tx. ex Westhoff & al. 1946

Hairgrass swards and bladderwort vegetation in oligotrophic and mesotrophic waters.

Kochev & al. 1986 [*Littorelletea* Br.-Bl. et Tüxen 1943]; Tzonev & al. 2009\* [*Isoëto-Littorelletea* Br.-Bl. et Vliieger in Vliieger 1937]

**Order *Littorelletalia uniflorae*** Koch ex Tx. 1937

Hairgrass swards and bladderwort vegetation in oligotrophic and mesotrophic waters.

**Alliance *Subularion aquatica*** Hadač 1971

Dwarf-herb amphibious vegetation on the edges of glacial lakes of the high mountains.

**Alliance *Littorellion uniflorae*** Koch ex Klika 1935

Vegetation of amphibious plants in fluctuating shallow oligo-mesotrophic waters.

**?Alliance *Sphagno-Utricularion*** T. Müller et Görs 1960

Vegetation dominated by bladderwort and peat-moss in oligotrophic and dystrophic peaty water pools.

**Alliance *Scorpidio-Utricularion minoris*** Pietsch 1965

Vegetation dominated by bladderwort and peat-moss in neutral reaction peaty water pools.

**Class Isoëto-Nanojuncetea Br.-Bl. et Tx. in Br.-Bl. & al. 1952**

Pioneer ephemeral dwarf-cyperaceous vegetation in periodically freshwater flooded habitats.

Tzonev & al. 2008, 2009

**Order Nanocyperetalia Klika 1935**

Pioneer ephemeral herb- and graminoid-rich late-season vegetation on periodically flooded soils.

**?Alliance Nanocyperion Koch 1926**

Pioneer dwarf cyperaceous vegetation on moist calcium-rich substrates of the sub-Mediterranean regions.

**Alliance Eleocharition soloniensis Philippi 1968**

Pioneer ephemeral rush-rich vegetation in temporarily flooded mesotrophic habitats.

**Alliance Verbenion supinae Slavnić 1951**

Pioneer ephemeral herb-rich vegetation in periodically flooded nutrient-rich habitats.

Horvat & al. 1974\*

**Marsh and swamp vegetation****Class Phragmito-Magnocaricetea Klika in Klika et Novák 1941**

Reed swamp, sedge bed and herbland vegetation of freshwater or brackish water bodies and streams.

Horvat & al. 1974\* [*Phragmitetea*]; Kochev & al. 1986; Dimitrov & al. 2005; Sopotlieva 2009b; Tzonev 2009a, 2009b, 2013, 2017; Valchev & al. 2012; Vassilev & al. 2014; Tzonev & al. 2009, 2019b [*Phragmitetea communis* Tx. et Psrg. 1942], 2022; Georgiev 2021

**Order Phragmitetalia Koch 1926**

Reed swamps, sedge beds and herblands of mesotrophic and eutrophic stagnating or slowly flowing fresh or brackish water bodies.

Dimitrov & al. 2005; Tzonev 2009a, 2009b; Valchev & al. 2012; Vassilev & al. 2014; Tzonev & al. 2009, 2019b; Georgiev 2021

**Alliance Phragmition communis Koch 1926**

Reed swamp vegetation of mesotrophic and eutrophic standing freshwater bodies or gently moving streams.

Dimitrov & al. 2005; Tzonev 2009a, 2009b; Valchev & al. 2012; Vassilev & al. 2014; Tzonev & al. 2009, 2019b; Georgiev 2021

**Order Bolboschoenetalia maritimi Hejný in Holub & al. 1967**

Meso-eutrophic brackish swamp reeds of the coasts and inland regions.

Sopotlieva 2009b

**Alliance Scirpion maritimi Dahl et Hadač 1941**

Meso-eutrophic brackish swamp reeds of coastal regions.

Sopotlieva 2009b

**(!)Order Saccharetalia ravennae** Biondi, Blasi et Casavecchia in Biondi & al. 2014

Mediterranean megareed beds of subsaline sandy intermittent rivers and hind dune depressions.

**(!)Alliance Imperato cylindricae-Saccharion ravennae** Br.-Bl. et O. de Bolòs 1958

Mediterranean megareed beds of subsaline sandy intermittent rivers and hind dune depressions.

**Order Magnocaricetalia Pignatti 1953**

Sedge-bed marsh vegetation.

Tzonev & al. 2013, 2022

**Alliance Magnocaricion elatae Koch 1926**

Sedge-bed marsh vegetation on oligotrophic to mesotrophic organic sediment.

**Alliance Magnocaricion gracilis Géhu 1961**

Sedge-bed marsh vegetation on eutrophic clayey sediments in riverine habitats.

Tzonev & al. 2009 [*Oenanthion aquaticae* Hejný ex Neuhäusel 1959], 2013

**Alliance Carici-Rumicion hydrolapathi Passarge 1964**

Vegetation on non-stabilized organic substrates in mesotrophic waters.

Tzonev 2009a [*Oenanthion aquaticae* Hejný ex Neuhäusel 1959]; Valchev & al. 2012 [*Oenanthion aquaticae* Hajny ex Neuhäusel 1959]; Tzonev & al. 2022

**Order Nasturtio-Glycerietalia Pignatti 1953**

Herblands and sedge-beds of well-oxygenated freshwater flowing streams.

Tzonev 2017; Tzonev & al. 2019b

**Alliance Glycerio-Sparganion** Br.-Bl. et Sissingh in Boer 1942

Herbland vegetation of small freshwater streams and in shallow water bodies.

Tzonev 2017; Tzonev & al. 2019b

**Order Oenanthetalia aquaticae** Hejný ex Balatová-Tuláčková & al. 1993

Vegetation of emergent helophytes in shallow waters with fluctuating water table.

Tzonev 2009a

**Alliance Eleocharito palustris-Sagittarion sagittifoliae** Passarge 1964

Vegetation of emergent helophytes on muddy soils of shallows streams and ponds with fluctuating water table.



## Vegetation of bogs and fens

### Class *Scheuchzerio palustris-Caricetea fuscae* Tx. 1937

Sedge-moss vegetation of fens, transitional mires and bogs.

Horvat & al. 1974 [*Scheuchzerio-Caricetea nigrae*]; Roussakova 2000 [*Scheuchzerio-Caricetea nigrae* (Nordh. 1937) Tx. 1937]; Hájek & al. 2005, 2008 [*Scheuchzerio-Caricetea nigrae* Tüxen 1937]; Hájková & al. 2006; Tzonev & al. 2009 [*Scheuchzerio palustris-Caricetea nigrae* Tüxen 1937], 2013 [*Scheuchzerio palustris-Caricetea nigrae* Tüxen 1937]; Vassilev & al. 2014

#### Order *Caricetalia davallianae* Br.-Bl. 1950 nom. cons.

Sedge-moss vegetation of calcareous and extremely mineral rich brown-moss fens.

Tzonev & al. 2009, 2013

#### Alliance *Caricion davallianae* Klika 1934

Sedge-moss vegetation of calcareous mineral-rich fens.

Hájek & al. 2008; Tzonev & al. 2009, 2013; Vassilev & al. 2014

#### Order *Sphagno warnstorffii-Tomentypnetalia* Lapshina 2010

Sedge and brown-moss nitrogen-limited fen vegetation.

#### Alliance *Sphagno warnstorffii-Tomentypnion nitentis* Dahl 1957

Moderately calcium-rich sedge-moss fens of the mountains.

Hájek & al. 2008; Tzonev & al. 2009; Vassilev & al. 2014; Velev & al. 2016; Hájek & al. 2021

#### Order *Caricetalia fuscae* Koch 1926

Sedge-moss vegetation of slightly to strongly acidic minerotrophic moderately-rich or poor fens.

Horvat & al. 1937; Roussakova 2000 [*Caricetalia nigrae* Koch. 1926 em Nordh. 1937]; Hájek & al. 2005, 2008; Tzonev & al. 2009; Vassilev & al. 2014

#### Alliance *Drepanocladion exannulati* Krajina 1933

Non-calcareous fens of the high mountains.

#### Alliance *Caricion fuscae* Koch 1926 nom. cons.

Sedge-moss vegetation of moderately to low calcium-rich slightly acidic fens dominated by calcifuge brown mosses or nutrient-demanding peat mosses.

Horvat & al. 1937; Horvat & al. 1974 [*Caricion canescenti-nigrae*]; Roussakova 2000 [*Caricion nigrae* Koch. 1926 em Klika. 1934]; Hájek & al. 2005; Hájková & al. 2006; Tzonev & al. 2009

#### Alliance *Sphagno-Caricion canescentis* Passarge (1964) 1978 nom. cons.

Peat-moss acidic poor yet minerotrophic fens.

Soó 1957 [*Caricion canescentis-fuscae* Nordh]; Hájek & al. 2005, 2008; Hájková & al. 2006; Tzonev & al. 2009; Vassilev & al. 2014; Velev & al. 2016

#### ?Alliance *Nartheccion scardici* Horvat ex Lakušić 1968

Relict oro-Mediterranean moderately rich fens.

### Class *Oxycocco-Sphagnetea* Br.-Bl. et Tx. ex Westhoff & al. 1946

Dwarf-shrub, sedge and peat-moss vegetation of the ombrotrophic bogs and wet heath on extremely acidic soils.

Roussakova 2000; Hájek & al. 2008; Tzonev & al. 2009

#### Order *Sphagnetalia medii* Kästner et Flössner 1933

Dwarf-shrub and peat-moss vegetation of the raised bogs in high-altitudes.

Roussakova 2000 [*Sphagnetalia magellanici* (Pawl. 1928) Moor (1964) 1968]; Hájek & al. 2008 [*Sphagnetalia magellanici* Kästner & Flössner 1933]; Tzonev & al. 2009

#### Alliance *Sphagnion medii* Kästner et Flössner 1933

Dwarf-shrub and peat-moss vegetation of the mountain raised bogs.

Roussakova 2000 [*Sphagnion magellanici* Kästner et Flössner 1933]; Hájek & al. 2008 [*Sphagnion magellanici* Kästner & Flössner 1933]; Tzonev & al. 2009

## Vegetation of water springs

### Class *Montio-Cardaminetea* Br.-Bl. et Tx. ex Klika et Hadač 1944

Vegetation of water springs.

Roussakova 2000; Hájek & al. 2005; Hájková & al. 2006; Tzonev & al. 2009, 2019b

#### Order *Cardamino-Chrysosplenietalia* Hinterlang 1992

Vegetation of soft-water springs in shady forest habitats in the submontane and montane belts.

Tzonev & al. 2009

#### Alliance *Caricion remotae* Kästner 1941

Vegetation of soft-water springs in shady forest habitats in the submontane and montane belts.

Tzonev & al. 2009

#### Order *Montio-Cardaminetalia* Pawłowski & al. 1928

Vegetation of cold oligotrophic water springs in the mountains.

Roussakova 2000; Hájek & al. 2005; Tzonev & al. 2009, 2019b

#### Alliance *Cardamino-Montion* Br.-Bl. 1926

Vegetation of cold oligotrophic water springs in the subalpine and alpine belts of mountains.

Roussakova 2000, Hájková & al. 2006 [*Philonotidion seriatae*, *Cratoneuro filicini-Calthion laetae*]; Tzonev & al. 2009 [*Philonotidion seriatae* Hinterlang 1992]

#### Alliance *Swertio perennis-Anisothecion squarrosi* Hadač 1983

Vegetation of cold oligotrophic water springs in the mountains.

?Alliance *Epilobio nutantis-Montion* Zechmeister in Zechmeister et Mucina 1994

Vegetation of oligotrophic water springs in the submontane and montane belts.

**Alliance *Cratoneurion commutati*** Koch 1928

Vegetation of moss-rich calcareous water springs in the montane and subalpine belts

Hájková & al. 2006; Tzonev & al. 2009, 2019b

**Alliance *Lycopodo europaei-Cratoneurion commutati*** Hadač 1983

Vegetation of moss-rich calcareous water springs in the coline and submontane belts.

**?Alliance *Pinguiculo balcanicae-Cardaminion acris*** Čarni et Matevski 2010

Vegetation of the oligotrophic water springs in the subalpine zone.

### Vegetation of freshwater algae

#### **Class *Charetea intermediae*** F. Fukarek 1961

Submerged macroalgal stonewort swards.

Kochev & al. 1986 [*Charetea fragilis* Fukarek ex Krausch 1964]; Tzonev & al. 2009

#### **Order *Charetalia intermediae*** Sauer 1937

Submerged macroalgal stonewort swards in neutral to alkaline and lime-rich waters.

Tzonev & al. 2009 c [*Charetalia hispidae* Sauer ex Krausch 1964]

**Alliance *Charion vulgaris*** (W. Krause et Lang 1977) W. Krause 1981

Ephemeral macroalgal stonewort swards in neutral to alkaline waters.

Tzonev & al. 2009 c

## ANTHROPOGENIC VEGETATION

#### **Class *Robinietea*** Jurko ex Hadač et Sofron 1980

Anthropogenically mediated forests on nutrient-rich soils.

Mucina & Kolbek 1989; Tzonev & al. 2019b; Grigorov & al. 2022; 2023b

#### **Order *Sambucetalia racemosae*** Oberd. ex Doing 1962

Elder, willow and hazel scrub on nutrient-rich soils developed in forest clearings.

Dimitrov & al. 2004a [*Sambucetalia* Oberd. 1957]; Tzonev & al. 2009 [*Sambucetalia racemosae* Oberd. 1957]

**Alliance *Sambuco-Salicion caprae*** Tx. et Neumann ex Oberd. 1957

Elder, willow and hazel scrub on nutrient-rich soils developed

in forest clearings.

Dimitrov & al. 2004a

**Order *Chelidonio-Robinietalia pseudoacaciae*** Jurko ex Hadač et Sofron 1980

Anthropogenic scrub comprising communities largely dominated by alien trees.

Tzonev & al. 2009, 2019b; Grigorov & al. 2022, 2023b

**?Alliance *Aegopodio podagrariae-Sambucion nigrae*** Chytrý 2013

Anthropogenic elder scrub in ruderal habitats.

**Alliance *Balloto nigrae-Robinion pseudoacaciae*** Hadač et Sofron 1980

*Robinia* groves with weedy understorey on loamy-sandy dry soils.

Tzonev & al. 2009, 2019b; Grigorov & al. 2022, 2023b

**?Alliance *Chelidonio majoris-Robinion pseudoacaciae*** Hadač et Sofron ex Vítková in Chytrý 2013

*Robinia* groves with weedy understorey on nutrient-rich mesic soils.

**?Alliance *Euphorbio cyparissiae-Robinion pseudoacaciae*** Vítková in Kolbek & al. 2003

*Robinia* groves and scrub in dry and warm habitats on shallow soils.

**Alliance *Chelidonio-Acerion negundo*** L. Ishbirdin et A. Ishbirdin 1989

Subspontaneous groves and scrub of *Acer negundo*.

#### **Class *Papaveretea rhoeadis*** S. Brullo & al. 2001 nom. cons.

Annual segetal vegetation of arable crops, gardens and vineyards.

Kolev 1976 [*Stellarietea mediae* Tx., Lohm., Prsg. 1950]; Tzonev & al. 2009 [*Stellarietea mediae* Tüxen & al. ex von Rochow 1951]; Glogov & Georgieva 2021 [*Stellarietea mediae* R.Tx., Lohmeyer et Preising in R.Tx. 1950]

**Order *Aperetalia spicae-venti*** J.Tx. et Tx. in Malato-Beliz & al. 1960 nom. cons.

Weed vegetation of cereal fields and gardens on acidic and nutrient-poor soils.

Kolev 1976 [*Chenopodietalia albi* Tx. et Lohm. 1950]; Tzonev & al. 2009 [*Atriplici-Chenopodietalia albi* (Tüxen 1937) Nordh. 1950]

**Alliance *Scleranthion annui*** (Kruseman et Vlieger 1939) Sissingh in Westhoff & al. 1946

Weed segetal vegetation of winter cereal crops on neutral to acidic loamy and sandy-loamy soils.

Kolev 1976; Tzonev & al. 2009

**?Alliance *Oxalidion europaeae*** Passarge 1978

Weed segetal vegetation of gardens and root crop fields on acidic loamy and sandy-loamy soils.

**Order *Papaveretalia rhoeadis*** Hüppe et Hofmeister ex Theurillat & al. 1995 nom. cons.

Weed segetal vegetation of arable crops on base-rich soils in the forest and forest-steppe zones.

Kolev 1976 [*Centauretalia cyani* (Tx. 1937) Tx., Lohm., Prsg.1950]; Tzonev & al. 2009 [*Centauretalia cyani* Tüxen & al. ex von Rochow 1951]

**Alliance *Caucalidion*** Tx. ex von Rochow 1951

Weed segetal vegetation of cereal crops on the base-rich soils. Kolev 1976 [*Caucalium lappulae* Tx. 1950]; Tzonev & al. 2009

**Alliance *Linion*** Rothmaler 1944

Weed segetal vegetation of flax fields.

Kolev 1976 [*Lolium remoti-Linion* Tx.1950]; Tzonev & al. 2009 [*Lolium remoti-Linion* Tüxen 1950]

**Alliance *Veronico-Euphorbion*** Sissingh in Passarge 1964

Weed segetal vegetation of vineyards and gardens on the base-rich soils.

**?Alliance *Matricario chamomillae-Chenopodion albi*** Timár 1954

Summer-annual segetal weed vegetation on clayey subsaline soils.

**Class *Sisymbrietea* Gutte et Hilbig 1975**

Zoo-anthropogenic vegetation of animal shelters and disturbed ruderal sites.

**Order *Sisymbrietalia sophiae*** J. Tx. ex Görs 1966 nom. cons.

Ruderal vegetation of annual nutrient-demanding herbs and grasses on disturbed soils.

Tzonev & al. 2009 [*Sisymbrietalia* Tüxen ex Oberd. 1962]; Glogov & Georgieva 2021 [*Sisymbrietalia officinalis* J. Tx. 1962]

**Alliance *Atriplicion*** Passarge 1978 nom. cons.

Ruderal vegetation of tall summer-annual herbs on sandy-loamy nutrient-rich ruderal soils.

Mucina, Kolbek 1989 [*Atriplici - Sisymbriion* Hejný 1978]

**Alliance *Cannabion sativae*** Golub & al. 2012

Ruderal vegetation of tall summer-annual herbs on heavy clayey nutrient-rich soils.

**Alliance *Malvion neglectae*** (Gutte 1972) Hejný 1978

Ruderal vegetation of low-grown short-lived summer-annual herbs on nutrient-rich loamy and slightly trampled soils.

Mucina, Kolbek 1989; Tzonev & al. 2009

**Alliance *Sisymbriion officinalis*** Tx. & al. ex von Rochow 1951

Ruderal vegetation of nutrient-demanding short-lived winter-annual grasses on sandy anthropogenic soils.

Kolev 1976; Meshinev & al. 2005; Tzonev & al. 2009

**Class *Chenopodietea* Br.-Bl. in Br.-Bl. & al. 1952**

Winter-annual weed segetal and ruderal vegetation of man-made habitats.

Horvat & al. 1974\*; Tzonev 2009a

**Order *Brometalia rubenti-tectorum*** (Rivas Goday et Rivas-Mart. 1973) Rivas-Mart. et Izco 1977 nom. cons.

Winter-annual ruderal vegetation of summer-dry man-made habitats.

**Alliance *Hordeion murini*** Br.-Bl. in Br.-Bl. & al. 1936

Mediterranean ruderal winter-annual grasslands.

Horvat & al. 1974\*; Glogov, Georgieva 2021 [*Hordeion leporini* Br.-Bl. (1931) 1947]

**Order *Chenopodietalia*** Br.-Bl. in Br.-Bl. & al. 1936

Winter-annual ruderal herb-rich vegetation on nutrient-rich disturbed soils.

Tzonev & al. 2009

**Alliance *Chenopodion muralis*** Br.-Bl. in Br.-Bl. & al. 1936

Mediterranean nutrient-demanding ruderal vegetation dominated by low-grown non-succulent herbs.

Horvat & al. 1974\*; Tzonev & al. 2009

**?Order *Geranio purpureae-Cardaminetalia hirsutae*** S. Brullo in S. Brullo et Marcenò 1985

Winter-annual fringe vegetation in shaded mesic disturbed habitats.

**?Alliance *Euphorbio taurinensis-Geranion lucidi*** Matevski et Čarni in Mucina & al. 2009

Mesic nitrophilous winter-annual fringe vegetation.

**Class *Digitario sanguinalis-Eragrostietea minoris* Mucina, Lososová et Šilc in Mucina & al. 2016**

Thermophilous grass-rich anthropogenic vegetation rich in summer-annual C4 species.

Tzonev & al. 2023

**Order *Eragrostietalia*** J. Tx. ex Poli 1966

Thermophilous grass-rich anthropogenic vegetation rich in C4 species on summer-dry sandy soils.

Horvat & al. 1974\*; Mucina & Kolbek 1989; Tzonev 2009a; Tzonev & al. 2009, 2023

**Alliance *Spergulo arvensis-Erodion cicutariae*** J.Tx. in Passarge 1964

Subthermophilous summer-annual weed vegetation on sandy and sandy-loamy soils.

Kolev 1976 [*Panico-Setarion* Sissingh 1946, *Eu-Polygono-Chenopodion polyspermi* (W.Koch 1926) Sissingh 1946]; Tzonev & al. 2009 [*Panico-Setarion* Sissingh in Westh. & al. 1946]

**Alliance *Eragrostion*** Tx. in Oberd. 1954

Thermophilous late-summer weed vegetation on sandy soils. Horvat & al. 1974\*; Tzonev 2009a; Tzonev & al. 2009 [*Amarantho-Chenopodion* Morariu 1943]

(+) **Alliance *Salsolion ruthenicae*** Philippi ex Oberd. 1983

Ruderal vegetation on disturbed gravelly and sandy soils.

Tzonev & al. 2023

**Order *Euphorbietalia prostratae*** Vicedo & al. 1997

Summer-dry trampled vegetation on sandy soils.

? **Alliance *Polycarpo-Eleusinion indicae*** Čarni et Mucina 1998

Summer-dry vegetation of sandy trampled habitats.

**Alliance *Eragrostio-Polygonion arenastri*** Couderc et Izco ex Čarni et Mucina 1998

Summer-dry trampled vegetation on sandy soils.

**Class *Polygono-Poetea annuae*** Rivas-Mart. 1975

Therophyte-rich dwarf-herb vegetation of trampled habitats.

Tzonev & al. 2009\*; Vassilev & al. 2022

**Order *Polygono arenastri-Poetalia annuae*** Tx. in Géhu & al. 1972 corr. Rivas-Mart. & al. 1991

Therophyte-rich dwarf-herb vegetation of trampled habitats.

Vassilev & al. 2022

**Alliance *Polygono-Coronopodion*** Sissingh 1969

Herb-rich vegetation in trampled habitats.

Vassilev & al. 2022

**Alliance *Polycarpion tetrphylli*** Rivas-Mart. 1975

Herb-rich vegetation in trampled sunny habitats of the southern regions.

**Alliance *Saginion procumbentis*** Tx. et Ohba in Géhu & al. 1972

Herb-rich vegetation in strongly trampled shady habitats.

Vassilev & al. 2022

**Class *Artemisietea vulgaris*** Lohmeyer & al. in Tx. ex von Rochow 1951

Dry ruderal plant communities composed of short-lived perennials.

Horvat & al. 1974\*; Tzonev 2009b; Tzonev & al. 2009; Vassilev & al. 2021

**Order *Onopordetalia acanthii*** Br.-Bl. et Tx. ex Klika et Hadač 1944

Subxeric ruderal vegetation dominated by short-lived perennials.

Horvat & al. 1974\*; Mucina & Kolbek 1989; Tzonev & al. 2009

**Alliance *Onopordion acanthii*** Br.-Bl. & al. 1936

Thistle-dominated xero-mesophytic ruderal vegetation.

Mucina & Kolbek 1989; Tzonev & al. 2009; Vassilev & al. 2021

**Alliance *Dauco-Melilotion*** Görs ex Rostański et Gutte 1971

Xero-mesophytic ruderal vegetation dominated by biennial plants.

Meshinev & al. 2005; Vassilev & al. 2021

**Order *Agropyretalia intermedio-repentis*** T. Müller et Görs 1969

Semiruderal grasslands and herblands and weed segetal vegetation of perennial crops..

Tzonev 2009b; Tzonev & al. 2009 [*Agropyretalia repentis* Görs 1966]; Vassilev & al. 2021

**Alliance *Convolvulo arvensis-Agropyron repentis*** Görs 1967

Semiruderal grasslands and herblands.

Meshinev & al. 2005; Vassilev & al. 2021 [*Convolvulo arvensis-Elytrigion repentis* Görs 1966]

**Order *Carthametalia lanati*** S. Brullo in S. Brullo et Marcenò 1985

Thistle-dominated ruderal vegetation on disturbed calcareous substrates.

? **Alliance *Silybo mariani-Urticion piluliferae*** Sissingh ex Br.-Bl. et O. de Bolòs 1958

Thistle-dominated ruderal vegetation.

**Alliance *Onopordion illyrici*** Oberd. 1954

Thistle-dominated ruderal vegetation

**Alliance *Scolymion hispanici*** Morariu 1967

Thistle-dominated ruderal vegetation of the Black Sea seaboards.

Meshinev & al. 2005

? **Order *Elytrigio repentis-Dittrichietalia viscosae*** Mucina *ined.* Anthropogenic sub-ruderal and ruderal thermophilous grasslands and herblands.

? **Alliance *Inulo viscosae-Agropyron repentis*** Biondi et Al. legrezza 1996

Anthropogenic sub-ruderal and ruderal grasslands and herblands of the sub-Mediterranean regions.

**Class *Epilobietea angustifolii*** Tx. et Preising ex von Rochow 1951

Tall-herb semi-natural perennial vegetation on disturbed forest

edges, nutrient-rich riparian fringes and in forest clearings.

Dimitrov 2004; Dimitrov & al. 2004a; Pedashenko & al. 2015 [*Galio-Urticetea* Passarge ex Kopecký 1969]; Vassilev & al. 2016 [*Galio-Urticetea* Passarge ex Kopecký 1969]; Tzonev 2017; Tzonev & al. 2009, 2009 [*Galio-Urticetea* Passarge ex Kopecký 1969]; 2019b

**Order *Galeopsio-Senecionetalia sylvatici*** Passarge 1981 nom. cons.

Tall-herb perennial semi-natural vegetation on acidic soils on forest margins and clearings.

Tzonev & al. 2009 [*Atropetalia* Vlieger 1937]

**Alliance *Epilobion angustifolii*** Oberd. 1957

Tall-herb semi-natural perennial vegetation on acidic soils of forest margins and in forest clearings.

Dimitrov 2004; Tzonev & al. 2009; [*Epilobion angustifolii* (Rübel 1933) Soó 1933]; Pedashenko & al. 2015 [*Holco mollis-Pteridion aquilini* Passarge (1994) 2002]

**Order *Circaeo lutetianae-Stachyetalia sylvaticae*** Passarge 1967 nom. cons.

Ruderal and semi-natural fringe mesic tall-herb vegetation on nutrient- and base-rich soils.

Pedashenko & al. 2015 [*Lamio albi-Chenopodietalia boni-henrici* Kopecký 1969]; Vassilev & al. 2016 [*Lamio albi-Chenopodietalia boni-henrici* Kopecký 1969]

**Alliance *Fragarion vescae*** Tx. ex von Rochow 1951 nom. cons.

Semi-ruderal herb-rich clearing vegetation on nutrient-rich calcareous soils.

**Alliance *Impatiēti noli-tangere-Stachyon sylvaticae*** Görs ex Mucina 1993

Semi-ruderal tall-herb vegetation of shaded mesic forest margins and clearings on loamy soils in the low mountain levels.

**Alliance *Aegopodion podagrariae*** Tx. 1967 nom. cons.

Semi-ruderal herb-rich vegetation on mesic margins and clearings of forests and scrub.

**Order *Arctio lappae-Artemisietalia vulgaris*** Dengler 2002

Ruderal vegetation dominated by short-lived perennials on mesic loamy soils.

**Alliance *Arction lappae*** Tx. 1937

Ruderal vegetation of short-lived perennials on mesic loamy soils.

Horvat & al. 1974\*; Tzonev & al. 2009

**Alliance *Balloto-Conion maculati*** S. Brullo et Marcenò 1985

Tall-herb perennial ruderal vegetation in mesic habitats of the southern regions.

**Order *Galio-Alliarietalia*** Oberd. in Görs et T. Müller 1969

Ruderal and semi-natural thermophilous fringe vegetation of short-lived herbs on nutrient-rich soils in the submontane and montane belts.

**Alliance *Geo urbani-Alliarion officinalis*** Lohmeyer et Oberd. in Görs et T. Müller 1969

Ruderal and semi-natural fringe thermophilous vegetation of short-lived low herbs on nutrient-rich soils.

Pedashenko & al. 2015; Vassilev & al. 2016

**Order *Convolvuletalia sepium*** Tx. ex Moor 1958

Semi-natural fringe vegetation on banks of rivers and other water bodies.

Tzonev 2017; Tzonev & al. 2019

**Alliance *Senecionion fluviatilis*** Tx. ex Moor 1958

Tall-herb fringe vegetation on nutrient-rich river banks.

**Alliance *Archangelicion litoralis*** Scamoni et Passarge 1963

Tall-herb fringe vegetation on river banks.

Tzonev 2017; Tzonev & al. 2019

**Class *Bidentetea*** Tx. & al. ex von Rochow 1951

Summer-annual pioneer vegetation of seasonally flooded nutrient-rich river alluvia, lacustrine banks and heavily nutrient-loaded anthropogenic habitats.

Horvat & al. 1974\*; Tzonev 2009b; Tzonev & al. 2009; Georgiev 2021

**Order *Bidentetalia*** Br.-Bl. et Tx. ex Klika et Hadač 1944

Summer-annual pioneer vegetation of seasonally flooded nutrient-rich river alluvia, lacustrine banks and heavily nutrient-loaded anthropogenic habitats.

Horvat & al. 1974\*; Tzonev 2009b; Tzonev & al. 2009; Georgiev 2021

**Alliance *Bidention tripartitae*** Nordhagen ex Klika et Hadač 1944

Summer-annual pioneer vegetation of periodically nutrient-rich river banks and drained muddy bottoms of eutrophic lakes.

Horvat & al. 1974\*; Tzonev 2009b; Tzonev & al. 2009, 2009 [*Polygono-Chenopodion polyspermi* Br.-Bl. et Tuxen 1943]; Georgiev 2021

**Alliance *Chenopodion rubri*** (Tx. in Poli et J. Tx. 1960) Hilbig et Jage 1972

Summer-annual pioneer vegetation in heavily nutrient-loaded and saline ruderal habitats.

**Order *Paspalo-Heleochloetalia*** Br.-Bl. ex Rivas Goday 1956

Summer-annual pioneer vegetation of periodically flooded sub-



saline nutrient-rich river alluvia.

Tzonev & al. 2009

?Alliance *Paspalo-Agrostion semiverticillati* Br.-Bl. in Br.-Bl. & al. 1952

Summer-annual pioneer vegetation of periodically flooded subsaline nutrient-rich river alluvia.

### Class *Oryzetea sativae* Miyawaki 1960

Weed vegetation of the rice fields.

Tzonev & al. 2009\*; Gussev & al. 2020

Order *Cypero difformis-Echinochloetalia oryzoidis* O. de Bolòs et Masclans 1955

Weed vegetation of the rice fields.

Gussev & al. 2020

Alliance *Oryzo sativae-Echinochloion oryzoidis* O. de Bolòs et Masclans 1955

Weed vegetation of the rice fields of the warm-temperate regions.

Gussev & al. 2020

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