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Contribution to the functional flora of Greece: a case study in the northwestern Pindus Mountains

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Abstract: Functional databases, that aim the aggregation and homogenization of functional trait data, constitute fundamental tools of ecological research, that increase data accessibility at global or regional scale. Grime's CSR (competitor, stress-tolerator, ruderal) life strategies is a prominent scheme of such functional data, for the fields of ecology and conservation biology. Here, we aimed at creating a new regional database of CSR strategies of plant taxa occurring in the northwestern Pindus Mountains, Greece. This database contains data across 481 taxa, calculated with the "Stratefy" method, through the measurement of three leaf traits. For the 48.02 % of these taxa, no CSR information was previously available in other databases. Additionally, we investigated the diversity of the CSR strategies between the general grassland and forest habitats occurring in the study area. We observed distribution of taxa mainly along the S–R axis for grassland habitats and the S–C axis for forest habitats. Finally, after comparing the CSR strategies of plant taxa calculated in our study with previously available CSR information from the literature, it is becoming prevalent that availability of such data at a local scale is crucial, since it can minimize the effects of undesirable characteristics of functional data aggregated from several different sources.

Keywords: CSR theory, functional trait database, Greece, life strategy, Pindus Mountains, plant taxa

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Introduction

The study of the functional facet of diversity has exponentially grown during the last two decades, with a wide variety of theoretical concepts, methods and frameworks being developed (Legras & al. 2018; Kattge & al. 2020; Mammola & al. 2021; De Bello & al. 2021). The field of functional diversity is based on the study of functional traits, which constitute measurable characteristics of individuals of species that describe their structure and function, while also having the potential to impact their fitness, by determining species responses to biotic and abiotic conditions across various scales of biological complexity (Violle & al. 2007; Suding & al. 2008). Exploration of the variation of such traits has been acknowledged to provide key insights into processes and patterns, such as plant species distribution, community assembly mechanisms, and ecosystem level responses to environmental changes (Wright & al. 2017; Umaña & al. 2017; Báez & al. 2022b).

The origin of the field of functional ecology with the incorporation of functional traits dates back to the early 20th century, with the classification of plants into life forms being among the first approaches aiming at the identification of relations between species characteristics and environmental conditions (Raunkiær 1934). During the same time, the concept of functional differentiation of species was also introduced into the field of community ecology, with the idea of species grouped based on their similarities in resource use (Elton 1927), and the emergence of the term "functional groups" (Cummins 1974). Toward the end of the 20th century, attempts for species classification into functional groups that would relate to specific ecosystem processes became more systematic (Grime 1974; Cummins 1974), leading to the first clear definition of functional diversity, with "function" used as a synonym of "adaptation" (Calow 1987). The late 1990s and early 2000s constituted a critical period for the flourishing of the functional diversity concept due to the raised concern regarding ecosystem functioning and the human

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impact on it. Under this perspective, functional heterogeneity of species was highlighted as a particularly useful approach for biodiversity investigation, with trait classification schemes being employed as a relatively easy and effective way of diversity assessment (Tilman & al. 1997; Westoby 1998). Probably, the first systematic effort for a standardized collection of plant trait measurements that could be employed as functional traits was conducted by the Unit of Comparative Plant Ecology, University of Sheffield (Hendry & Grime 1993), where 67 traits were measured for 49 species of the British flora. Understanding of the usefulness of this rising approach led to the urgent need for a unified and standardized approach for measuring functional diversity. This would have to bring consensus within the scientific community regarding the suitability of the various plant characteristics for constituting appropriate and effective functional traits, as well as to provide detailed steps of functional trait measurements that would allow interchangeability of trait records across studies (Cornelissen & al. 2003).

More systematic efforts of trait data collection were made during the 2010s, with a number of databases of functional traits being created aiming at making functional trait data accessible to the scientific community, and supporting research related to major ecological questions. Initially, a number of smaller functional trait databases were created, focusing on particular regions, such as the databases of BiolFlor, LEDA, BASECO, BIOPOP and the Ecological Flora of the British Islands (Fitter & Peat 1994; Klotz & al. 2002; Poschlod & al. 2003; Gachet & al. 2005; Kleyer & al. 2008). Additionally, databases focusing on specific traits have been created, such as D3, LT-Brazil and SID (Hintze & al. 2013; Liu & al. 2019; Mariano & al. 2021). Subsequently, and with the increasing awareness regarding the importance of data availability, the creation of global functional databases followed (also called "databases of databases"), aiming at the collection, organization and standardization of previously available functional data, such as TRY (Kattge & al. 2020), BIEN (Maitner & al. 2018) and GIFT (Weigelt & al. 2020).

During the first period of increasing functional diversity investigation, community ecologists mainly focused on the usage of the mean and variance of traits at the species level, and employed such data toward the exploration of the relationship between environment and trait variability (Cavender-Bares & al. 2004; Šímová & al. 2015). Further research gradually led to the understanding of the insufficiency of such an approach due to the effects of intraspecific trait variation (Lichstein & al. 2007; Albert & al. 2010), and of trait covariance (Laughlin 2014). Therefore, trait data collection at a local scale, and the subsequent creation of local functional trait databases, continued to be of crucial importance, but a smaller number of such region-specific databases has been created during the last decade, such as BROT and FunAndes (Tavşanoğlu & Pausas 2018; Báez & al. 2022a).

During this history of increasing interest in functional traits, functional trait databases have become not only a great tool for the research field of trait ecology, but also significant contributors to several other research fields, including population and community ecology (McGill & al. 2006; Violle & al. 2012), biogeography (Violle & al. 2014), trait evolution (Moles & al. 2005), palaeobiology (Royer & al. 2007), plant geography (Swenson & Weiser 2010), evolutionary biology (Wiens & al. 2010), as well as conservation biology (Cadotte & al. 2011; Brodie & al. 2018). Therefore, functional traits have emerged as a useful approach for answering challenging and long-standing ecological questions that has already complemented or even replaced other, more traditional approaches of measuring biodiversity. For example, functional trait data have facilitated conservation efforts that focus at the ecosystem instead of the species level (Cadotte & al. 2011), while they have been particularly informative of complex processes, through the measurement of a set of easily accessible characteristics of organisms (Wright & al. 2004; Foden & al. 2013; Dudley & al. 2019). Moreover, functional traits have been integrated along several distinct stages of conservation and management practices, such as the vulnerability assessment and the prediction of extinction risk, the prioritization of monitoring and management actions, as well as the implementation and evaluation of conservation actions (Gallagher & al. 2021). The extended use of functional traits within the context of the various aforementioned applications led to classification of plant characteristics to either response or effect functional traits, corresponding to traits that respond to the biotic or abiotic environment or traits that affect ecosystem processes, respectively (Díaz & Cabido 2001). Furthermore, the identification of relationships among specific traits led to the introduction of the concept of trait syndrome, referring to functional traits that tend to covariate, such as combination of traits related to pollination, dispersal ability and succulence (Janson 1983; Waser & al. 1996; Ogburn and Edwards 2009). The Grime's CSR model of plant strategies (Grime 1974, 2001) is included among the most known and used approaches to functional syndromes in functional ecology.

Grime's model assumes that functional responses of plants vary across different intensities of stress and disturbance in a local scale and can be employed to identify the functional signature of species and communities along environmental gradients or stages of vegetation succession (Li & Shipley 2017; Rosenfield & al. 2019; Zanzottera & al. 2020). According to the CSR model, stress (constraints on biomass production) and disturbances (physical damage) act as restricting aspects of vegetation, reducing competition for resource acquisition among neighbours (Grime 1974). Ecosystems of low stress and disturbance are expected to be inhabited by plants of high competitive ability. On the other hand, habitats of high stress but low disturbance are dominated by stress-tolerators, while ruderals are more common in the opposite case of low stress but high disturbance (Grime 1974). The methodology for classifying plant taxa into different CSR strategies has been developed and refined over several years (Grime 1977; Hodgson & al. 1999; Pierce & al. 2013, 2017). Particularly, the initial methodology developed by Hodgson & al. (1999) for the allocation of life strategies to herbaceous vascular plants across the CSR triangle, was based on seven morphological and phenological traits. According to Hodgson's scheme, plant life strategies could be categorized into 19 classes, including 3 primary (C, S, and R), 4 secondary (CS, CR, SR and CSR) and 12 tertiary (C/CR, C/CS, C/CSR, CR/CSR, CS/CSR, R/CSR, S/CS, S/CSR, S/SR, SR/CSR, R/CR and R/SR). Pierce & al. (2017, 2013) substituted the traits originally proposed by Hodgson & al. (1999) with only three, easily measured, leaf traits (leaf area, leaf dry matter content and specific leaf area), and developed the calculator tool named "StrateFy", therefore allowing the extension of the applicability of the method to both woody and herbaceous vascular plants (Pierce & al. 2013, 2017). The latter constitutes the most recent approach of CSR ordination (Pierce & al. 2013, 2017), and has been proved to be easy to apply at the global scale, as well as able to correctly predict the expected responses of taxa to stress and disturbance (Li & Shipley 2017).

Application of the CSR model has been employed to answer ecological questions related to the correct prediction of a community's responses to stress and disturbance in relation to community processes, such as species coexistence, patterns of ecosystem resilience or succession, species richness and productivity (Lepš & al. 1982; Caccianiga & al. 2006; Cerabolini & al. 2016; Li & Shipley 2017; Zanzottera & al. 2020; Guerra & al. 2021; Bricca & al. 2021).

Within the context of abandonment of traditional land use and the subsequent changes in land cover through the secondary succession patterns, we aimed at collecting new functional trait data that would allow the investigation of functional diversity, with an emphasis on traits used for calculating plant life strategies. Moreover, the present study is part of a general effort of the vegetation research team of the Laboratory of Systematic Botany and Phytogeography of the Aristotle University of Thessaloniki to build a database of functional traits of the Greek flora. The present study constitutes a part of this general effort and was conducted in a mountainous region of northwestern Greece characterized by high species and habitat diversity. Given the significant lack of primary functional data throughout Greece (but see Adamidis & al. 2021; Fyllas & al. 2020; Michelaki & al. 2019), combined with the known importance of intraspecific variation of traits, the necessity for primary data collection was considered crucial. The study specifically aimed at: (1) presenting the life strategy according to Grime's CSR scheme for a major part of the flora of the studied area and a significant part of the flora of the Northern Pindus floristic region; (2) comparing the newly calculated CSR life strategies of the plant taxa found in our study area with any data of life strategies available in the existing databases, to investigate the level of intraspecific variation in life strategy syndromes; and (3) calculating the functional signature of the main habitat types identified in the study area.

Material and methods

Study area

The present study was conducted in the northwestern submontane region of the Pindus Mountains in Greece, mainly throughout the municipalities of Pogoni and Zitsa (Fig. 1). This area was selected due to the high levels of land use abandonment reported for the general region (Zomeni & al. 2008; Liarikas & al. 2012). A total of five circular collection sites, with a diameter of 6 km each and a total cover of 141.4 km^2, were selected based on a preliminary investigation of the observed changes in relation to land use. The five circular collection sites, named after the village with the largest population within each circle, were Vissani (1), Doliana (2), Sitaria (3), Protopappas (4) and Kouklioi (5), and they are presented in Fig. 1. Elevation ranged from 248 to 1203 m, while the general area is characterized by gentle slopes (0–10°), reaching a maximum of 55°. According to Köppen–Geiger climatic classification, the area belongs to the Csa type (Peel & al. 2007). The geological substrate of the study area is constituted by 50 % limestone, 25.4 % sediments, 18.9 % silicate and 5.7 % flysch (Nakos 1991). Finally, the area belongs to the vegetation formation of thermophilous mixed deciduous broad-leaved forests, and specifically the Pannonian-Danubian-Balkan lowland to submontane Balkan oak-bitter oak forests and southern and eastern Balkan, as well as Crimean-western Caucasian colline oriental hornbeam-downy oak forests (Bohn & al. 2000/2003; 2004).

Collection of plant material

During the late spring and early summer of 2020, 250 vegetation plots were sampled within the five circular sites (50 plots per site). In each site 25 grasslands-shrublands (shrub or tree cover lower than 10 % for grasslands and between 10 and 70 % for shrubs) and 25 forest (shrub or tree cover higher than 70 %) plots were sampled. Each forest vegetation plot had an area of 200 m^2 for all vascular taxa, while grassland and shrubland plots had an area of 50 m^2 for the herbaceous taxa and 200 m^2 for the shrub and tree taxa. In each plot, exact coordinates, altitude, slope and exposition were also recorded. In the following year 2021, we revisited the sampling sites (within the same period of the year), and tried to re-collect fully developed samples of at least all the taxa recorded in more than 5 plots, or any other taxa that had not been recorded during the sampling of 2020, but were found to have a high occurrence frequency and coverage during 2021. For each taxon, an effort for collection of 5 individuals was made, so as to adequately capture the functional signature of each taxon. Collection of more than 5 individuals per taxon was usually not preferred, after taking into account the high number of taxa targeted for measurement of functional traits and the available time and resources. Plant specimens collected during sampling were taxonomically identified by employing Flora Hellenica (Strid & Tan 1997, 2002), Mountain Flora of Greece (Strid 1986; Strid & Tan 1991), Flora Europaea (Tutin & al. 1972, 1976, 1976, 1980, 1993), Atlas of the Aegean Flora (Strid 2016) and taxonomic monographs. Finally, species nomenclature followed the Vascular Plants Checklist of Greece (Dimopoulos & al. 2013, 2016, 2022). Plant specimens are deposited in the TAU Herbarium (School of Biology, Aristotle University of Thessaloniki, Greece). The sampled plots were distributed along altitudes ranging from 302 to 905 m, and along slopes from 0°–39°. The habitat types distinguished in the present study, based on floristic and ecological differentiation of sampling plots, were: i) semi-natural grasslands (SG), including 45 plots, ii) old fields (OG), 54 plots, iii) meadows (MG), 22 plots, iv) *Pteridium aquilinum* stands (PG), 4 plots, v) mesic forests (MF), 54 plots, vi) xerothermophytic forests (XF), 67 plots and vii) riparian forests (RF), 4 plots.

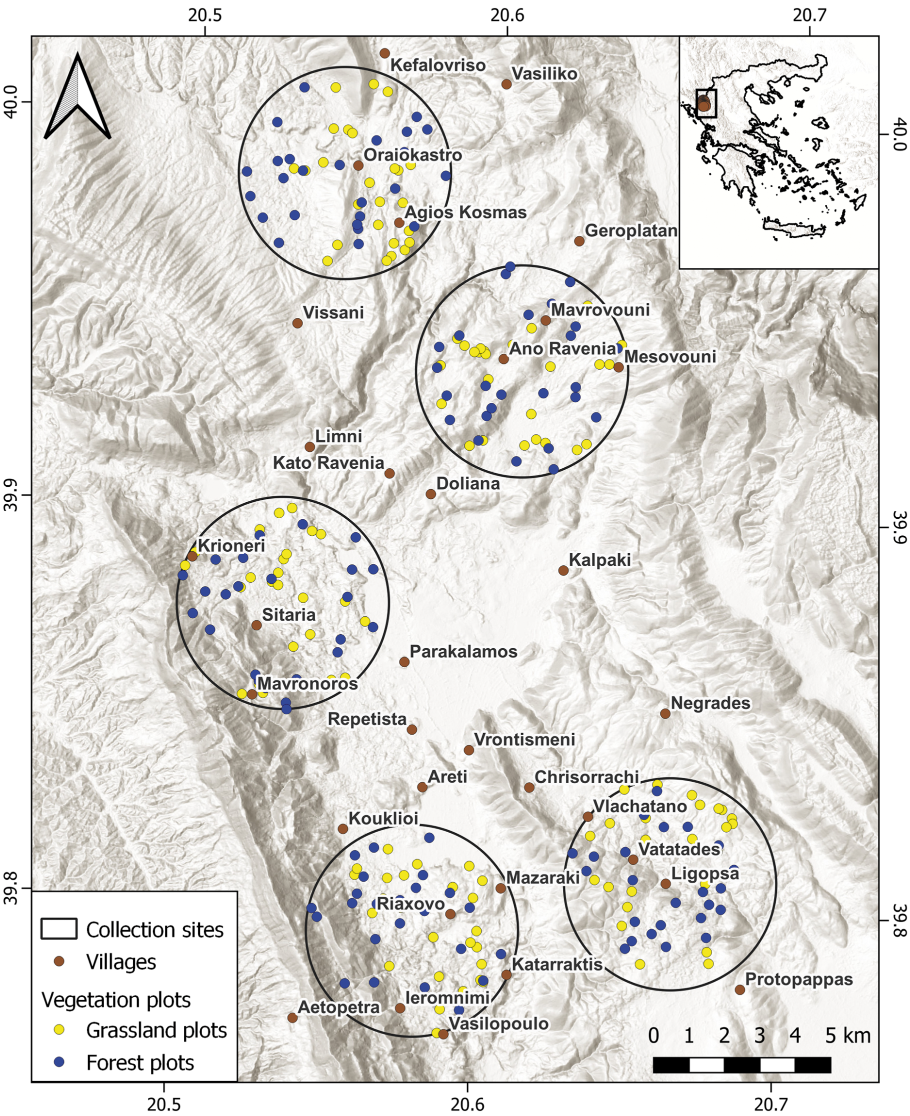

Fig. 1. Map of study area, depicting five circular collection sites and their location in Greece depicted as grey-filled rectangle (top right).

The habitat type of semi-natural grasslands includes vegetation communities mostly dominated by *Chrysopogon gryllus* and *Phlomis fruticosa*, submitted to frequent grazing. They occur in areas with low soil nutrient and moisture availability combined with relatively high air temperatures. Old fields represent vegetation communities occurring in abandoned fields dominated mostly by *Hordeum bulbosum* and currently submitted to regular grazing and/or irregular mowing. This community develops on plain soils (former arable lands) rich in nutrients, but with moderate soil moisture. Meadows include lowland hay meadows, usually dominated by *Alopecurus rendlei* and regularly mowed at least once a year (early summer), as well as mesic meadows with *Cynosurus cristatus* submitted to different intensities of periodic grazing. Pteridophyte stands constitute vegetation communities dominated by *Pteridium aquilinum*, which have possibly been established after the destruction of forests on acidic substrates, characterized by a very restricted distribution in the study area. The habitat type of mesic forests includes *Quercus frainetto* communities and mixed *Quercus cerris*-*Q. frainetto* communities, occurring on relatively deep and rich in nutrients soils, and are under a mild disturbance regime of relatively limited logging. The habitat type of xero-thermophytic oak (i.e. *Q. pubescens*, *Q. trojana*, *Q. coccifera*) forests as well as high scrubs or low forests of *Carpinus orientalis*, consists of communities submitted to medium disturbances, such as intensity grazing and resting of livestock, and occurs in shallow and rocky soils, on steep slopes. Finally, riparian forests include vegetation communities dominated by *Alnus glutinosa* or *Platanus orientalis* along streams, and are very spatially restricted in our study area.

During the functional trait sampling, for each taxon we measured leaf area (LA; mm^2), leaf dry matter content (LDMC: leaf dry weight/water-saturated leaf weight; mg/g) and specific leaf area (SLA: leaf area/leaf dry weight; mm^2 /mg), following the standard protocols (Cornelissen & al. 2003; Pérez-Harguindeguy & al. 2013). Specifically, one leaf from each individual (the most representative photosynthetic unit of each taxon) was selected and its cut end was submerged in water. After their rehydration, each leaf was scanned with an Epson Perfection V19 scanner and weighted using a precision scale (KERN ABJ120-4NM, Kern und Sohn GmbH, Balingen, Germany; accuracy 0.1 mg). For measuring dry weight, all leaves were then placed in an oven at 70 ˚C for at least 72 h and were subsequently weighted again so as to determine their dry mass. Finally, the area of each leaf was measured by means of the image analysis software ImageJ (https://imagej.nih.gov/ij/, accessed January 2023).

Plant life strategies

CSR strategies were initially calculated at the individual level, while secondly at the taxon level, by using the centroid CSR values of all individuals per taxon with the application of the "Stratefy" method (Pierce & al. 2017). In order to identify the functional signature of each habitat type, Community-Weighted Mean (CWM) values for C, S, and R scores were calculated using CSR scores of species occurring in each habitat type, weighted by their occurrence frequency (Behroozian & al. 2020), with the *functcomp* function of the R package FD (Lavorel & al. 2008). The data regarding occurrence frequency of taxa in habitat types were obtained from the initial sampling of the 250 vegetation plots. Specifically, taxa occurring in less than 5 % of the plots of the studied habitat type were considered as rare and were weighted with the value of 0.025, taxa in less than 30 % were considered as occasional and were weighted with the value of 0.175, taxa in less than 50 % were considered as frequent and were weighted with the value of 0.4, while taxa in more than 50 % were considered as common and were weighted with the value of 0.75.

To investigate the degree of variability among the tertiary CSR strategies calculated for each taxon in the present study versus the previously available tertiary CSR strategies included in other databases, we searched for the main available sources that provide CSR strategy information for a high number of taxa in the literature. Sources that were found to include data of tertiary CSR strategies for a great number of taxa were the Electronic Comparative Plant Ecology (Hodgson & al. 1995), the PLADIAS Database of the Czech flora and vegetation (Chytrý & al. 2021) and the original paper of Pierce & al. (2017). Although TRY (Kattge & al. 2020) and BiolFlor (Klotz & al. 2002) included data of CSR life strategies for a greater number of taxa, these were only available at the level of primary and secondary strategies, and therefore they could not be employed for comparison with our dataset. For all the taxa that we found such information, we calculated the distance (number of tertiary strategies) between the CSR strategy calculated from the present study and the CSR strategy available from each database. As distance, we considered the shortest path along neighbouring polygons of tertiary strategies in the CSR triangle, between the position of each taxon based on our calculation and the respective position that was found in the available sources.

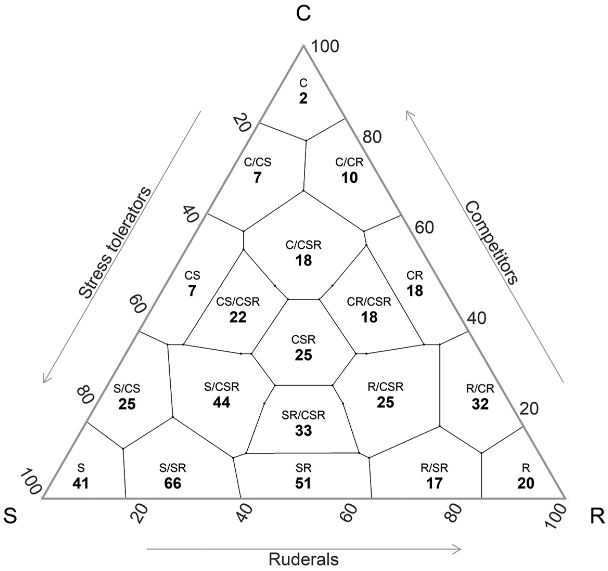

Fig. 2. Number of plant taxa (bold font) identified for each life strategy (regular font) of CSR triangle.

Floristic catalogue

We compiled a floristic catalogue including all the taxa recorded within the study area during the vegetative periods of 2020 and 2021. This includes families, genera, species and subspecies arranged alphabetically within the three main taxonomic groups: pteridophytes, gymnosperms and angiosperms. For each taxon, the following information is provided: i) locality of occurrence, corresponding to the circular collection sites where the taxon was found to occur, ii) habitat type of occurrence, corresponding to the general habitat types distinguished in the present study, and iii) CSR life strategy.

Results

The regional flora of the study area, based on our two samplings conducted during 2020 and 2021 included 629 taxa, belonging to 318 genera and 81 plant families. These included 4 Greek endemic taxa, namely *Fri-*

tillaria ionica subsp. *ionica*, *Silene niederi*, *Veronica chamaedrys* subsp. *chamaedryoides* and *Veronica glauca* subsp. *peloponnesiaca*. *Fritillaria ionica* subsp. *ionica* is a geophyte, occurring in four of the 13 floristic regions of Greece as adopted in *Flora hellenica* vol. 1 (Strid & Tan 1997). *Silene niederi* is a hemicryptophyte, occurring in seven of the 13 floristic regions of Greece, while it is also included in the national list of protected species of Greece (Presidential Decree 67/81). *Veronica chamaedrys* subsp. *chamaedryoides* is a hemicryptophyte, occurring in 10 of the 13 floristic regions of Greece. Finally, *Veronica glauca* subsp. *peloponnesiaca* is a therophyte, occurring in eight of the 13 floristic regions of Greece. The distribution of the 629 studied taxa in chorological types as well as life forms are given in Supplement 1 (Fig. S1 and S2).

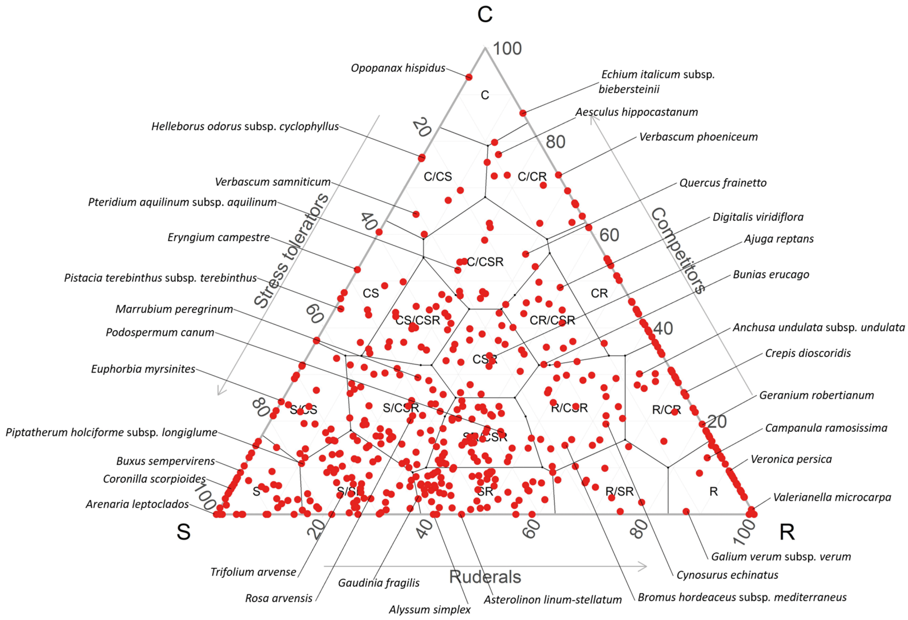

Fig. 3. Distribution of studied plant taxa (red dots) within CSR triangle. Arrows indicate increasing importance for each factor (competition, stress and disturbance), and letters represent competitive (C), stress tolerant (S) and ruderal (R) strategy. Taxa names represent examples of taxa belonging to different CSR strategies.

The 629 recorded taxa consist the 22.40 % of all the taxa that can be found in the floristic region of Northern Pindus (Dimopoulos & al. 2016), where our study area is located, corresponding to 23.37 % of species (621 from 2572 species occurring in Northern Pindus) (Dimopoulos & al. 2016). From the taxa that we recorded during our sampling, only the 24 were not mentioned as present in Northern Pindus (Dimopoulos & al. 2022). These taxa included 9 species, with seven (7) species being widely distributed in rest of mainland Greece (*Aphanes arvensis*, *Centaurium maritimum*, *Cerastium dubium*, *Filago gallica*, *Linum trigynum*, *Psilurus incurvus* and *Rosmarinus officinalis*) and two more restricted species (*Geranium lanuginosum* and *Poa hybrida*). Moreover, they included 11 subspecies that although not mentioned as present in Northern Pindus for the subspecies level, they are present for the species level (*Avena sterilis* subsp. *ludoviciana*, *Biarum tenuifolium* subsp. *tenuifolium*, *Centaurium tenuiflorum* subsp. *acutiflorum*, *Cuscuta approximata* subsp. *approximata*, *Echinops sphaerocephalus* subsp. *sphaerocephalus*, *Euphorbia phymatosperma* subsp. *cernua*, *Knautia integrifolia* subsp. *integrifolia*, *Piptatherum holciforme* subsp. *longiglume*, *Salvia pratensis* subsp. *pratensis*, *Tanacetum corymbosum* subsp. *cinereum* and *Verbascum glabratum* subsp. *bosnense*). Additionally, there were four (4) subspecies recorded for Northern Pindus which were not previously mentioned as occurrent either at the subspecies or the species level (*Blackstonia acuminata* subsp. *acuminata*, *Hippocrepis unisiliquosa* subsp. *unisiliquosa*, *Juncus gerardi* subsp. *gerardi* and *Plantago bellardii* subsp. *bellardii*).

Functional trait data were collected from 481 taxa (76.4 % of all recorded taxa), belonging to 263 genera and 72 plant families, and plant life strategy was subsequently calculated for each taxon. These taxa were found to belong to all the 19 possible plant life strategies and, as it is shown from their distribution across the CSR triangle (Fig. 2 and 3). In Supplement 2, the life strategies of all individuals investigated per taxon as well as the centroid life strategy per taxon are given. An overview of the distribution of the investigated taxa along the life strategies can be achieved by grouping the taxa that are characterized by the significant prevalence of one of the three life strategies (Fig. 2; Supplement 1 Table S1). The competitive strategy was the least common within our dataset, with only 19 (3.95 %) of the 481 investigated taxa having particularly high values of the competition strategy and belonging to the C, C/CR and C/CS life strategies. High values of the ruderal strategy were recorded for 69 (14.35 %) of the investigated taxa, and belonged to the strategies R, R/CR and R/SR. A greater number of taxa was found to have particularly high values of the strategy of stress tolerance, with 132 (27.44 %) taxa belonging to the strategies S, S/CS and S/SR. Finally, 261 (54.26 %) taxa were found to have intermediate levels of the three main strategies.

Although the species pools of most of the habitat types distinguished in the present study included taxa with great diversity of life strategies, after weighting taxa with their occurrence frequency within each habitat type, it was observed that the dominant and abundant

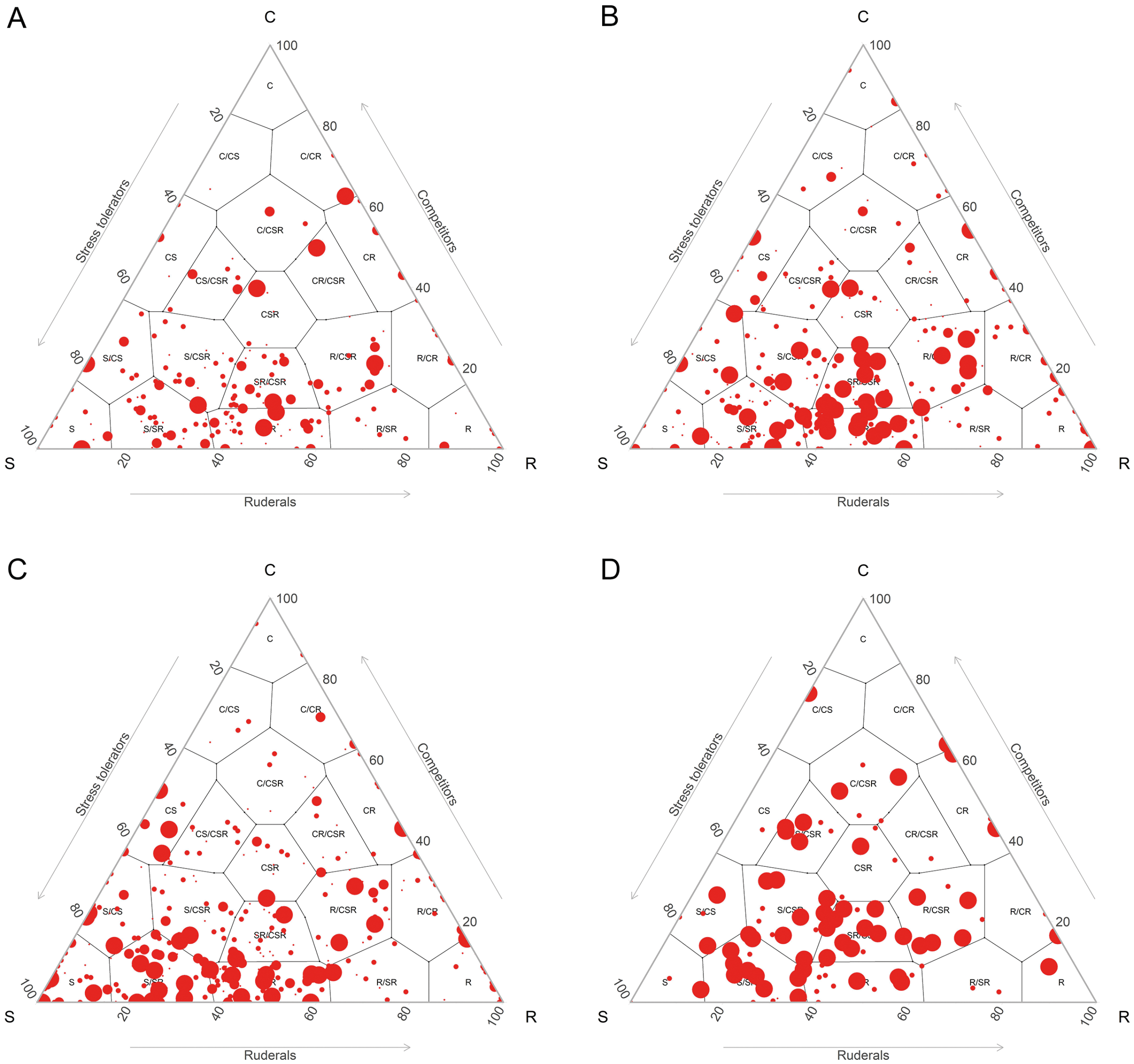

Fig. 4. Distribution of plant taxa (red dots) belonging to species pool of each grassland habitat type (A: meadows, B: old fields, C: semi-natural grasslands, D: pteridophyte stands), within CSR triangle. Size of dots corresponds to occurrence frequency of each taxon in each habitat type, from smallest dots representing rare taxa, to largest dots representing more frequent taxa in each habitat type. Arrows indicate increasing importance for each factor (competition, stress and disturbance), and letters represent competitive (C), stress tolerant (S) and ruderal (R) strategy.

taxa of each habitat type had more similar life strategies (Fig. 4 and 5) eventually resulting in a differentiation of the CSR signatures of the habitat types (Fig. 6). There was a clear differentiation between the CSR functional signature of grassland and forest communities, with grasslands demonstrating higher levels of the stress tolerating strategy, contrary to forests which were characterized by higher prevalence of the competitive strategy.

From the total 481 taxa with newly calculated CSR strategies from our study area, the 250 (51.98 %) were found to have available information regarding their CSR strategy in at least one of the three abovementioned databases (Fig. 7). When comparing the life strategies provided by these databases with our newly calculated data, it appeared that only a small percentage of taxa differed more than two tertiary strategies. Specifically, for all the databases a high number of taxa had the same or adjacent CSR strategy with the one found in the present study: 54 % for ECPE, 70 % for Pierce & al. (2017) and 65 % for PLADIAS. The highest level of differentiation was observed between our data and the ECPE database, where, for 14 % of the taxa, the newly calculated life strategy differed more than two strategies from the one recorded in the ECPE database. On the other hand, the lower level of differentiation was observed for the dataset of Pierce & al. (2017), where only 7 % of the taxa had a difference of more than two life strategies.

Floristic catalogue

Herein, the floristic catalogue includes the 481 taxa with newly calculated CSR strategies from our study area. In Supplement 3, an additional floristic catalogue is provided, including the remaining taxa recorded in our study area during vegetation sampling, for which CSR strategies were not calculated.

In the floristic catalogue the following abbreviations are used:

[1, 2, 3, 4, 5]: taxon found in collection site 1 (Vissani), 2 (Doliana), 3 (Sitaria), 4 (Protopappas) and 5 (Koukloi).

[MG, OG, PG, SG, MF, RF, XF]: taxon found in grassland habitat type of meadow (MG), old fields (OG), pteridophyte stands (PG) or semi-natural grasslands (SG) and mesic (MF), riparian (RF) or xerothermophytic (XF) forests.

[C, F, O, R, (ft)]: Common (C), frequent (F), occasional (O) or rare (R) taxon in each habitat type or a taxon not recorded in the sampled vegetation plots, found only during the functional trait sampling (ft). For more details on this scaling, see the Plant life strategies in the Methods section.

[C; C, CS, C/CR(1,2,3…)]: CSR life strategy of taxon. The general life strategy of the taxon, followed by the distinct life strategies observed for the sampled individuals, with the number of individuals for each life strategy given in parenthesis.

!: the exclamation mark indicates taxa which are relatively common in the dataset but not all specimens are completely identifiable to the subspecies level.

Pteridophytes

Aspleniaceae

Asplenium ceterach L. [2, 4]; [SG(O), XF(C)]; [CS/CSR; CS(1), CS/CSR(2), CSR(1)]

Asplenium onopteris L. [2, 3, 4, 5]; [MF(O), XF(C)]; [C/CSR; C/CSR(2), CR/CSR(1), CS(1)]

Asplenium trichomanes subsp. *quadrivalens* D. E. Mey. [2]; [MF(R), XF(O)]; [S/CSR; S/CSR(5)]

Dennstaedtiaceae

Pteridium aquilinum (L.) Kuhn subsp. *aquilinum* [1, 2, 5]; [PG(C), MF(C), XF(O)]; [C/CSR; C/CSR(2), CS/CSR(2)]

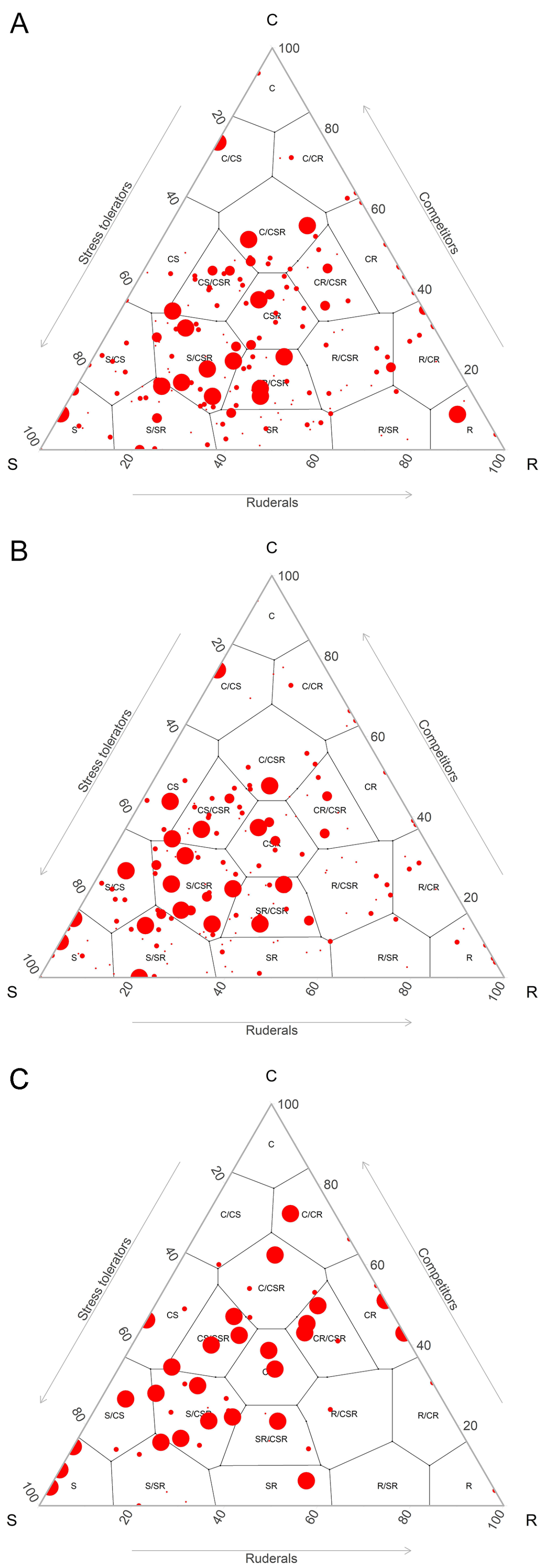

Fig. 5. Distribution of plant taxa (red dots) belonging to species pool of each habitat type (A: mesic forests, B: xerothermophytic forests, C: riparian forests), within CSR triangle. Size of dots corresponds to occurrence frequency of each taxon in each habitat type, from smallest dots representing rare taxa, to largest dots representing more frequent taxa in each habitat type. Arrows indicate increasing importance for each factor (competition, stress and disturbance), and letters represent competitive (C), stress tolerant (S) and ruderal (R) strategy.

Dryopteridaceae

Dryopteris pallida (Bory) Maire & Petitm. subsp. *pallida* [3]; [XF(R)]; [C/CR; C/CR(1), C/CS(1)]

Equisetaceae

Equisetum telmateia Ehrh. [3, 5]; [RF(C)]; [S; S(5)]

Gymnosperms

Cupressaceae

Juniperus oxycedrus subsp. *deltoides* (R. P. Adams) N. G. Passal. [2, 3, 5]; [PG(O), SG(O), MF(O), XF(O)]; [S; S(4), S/SR(1)]

Angiosperms

Acanthaceae

Acanthus spinosus L. [1, 2, 3, 4]; [OG(O)]; [CS; CS(4)]

Aceraceae

Acer campestre L. [1, 2, 3, 4, 5]; [SG(R), MF(O), XF(F)]; [S/CSR; S/CSR(3), SR/CSR(1)]

Acer monspessulanum L. subsp. *monspessulanum* [1, 2, 3, 4]; [MG(R), OG(O), PG(O), SG(O), MF(O), RF(O), XF(C)]; [S/CSR; S/CSR(4)]

Acer opalus subsp. *obtusatum* (Willd.) Gams [1, 2, 3, 4, 5]; [MF(O), XF(O)]; [CS/CSR; C/CSR(2), CS/CSR(1), CSR(2)]

Alliaceae

Allium cepa L. [1, 4]; [MF(R), XF(R)]; [S; S(1)]

Allium guttatum subsp. *tenorei* (Parl.) Soldano [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(C), XF(R)]; [S; S(8), S/CS(1)]

Anacardiaceae

Cotinus coggygria Scop. [3, 5]; [MF(R), XF(O)]; [CS; CS(1), S/CS(2), S/CSR(1)]

Pistacia terebinthus L. subsp. *terebinthus* [1, 2, 3, 5]; [OG(R), SG(F), MF(R), XF(O)]; [CS; CS(5)]

Apiaceae

Bupleurum glumaceum Sm. [1, 2, 3, 4, 5]; [MG(ft), OG(O), PG(O), SG(F)]; [SR; S/SR(3), SR(2)]

Chaerophyllum nodosum (L.) Crantz [1, 2, 3, 4, 5]; [SG(R), MF(O), RF(O), XF(O)]; [C/CSR; C/CSR(4)]

Chaerophyllum temulum L. [3, 4, 5]; [MF(R), RF(C), XF(ft)]; [CR/CSR; CR/CSR(4), R/CSR(1)]

Daucus carota L. s.l. [2, 3, 5]; [MG(F), OG(F), PG(O), SG(O)]; [C/CSR; C/CR(1), C/CSR(2), CS(1), CS/CSR(1)]

Daucus guttatus Sm. subsp. *guttatus* [1, 2, 3, 4, 5]; [MG(ft), OG(F), SG(O)]; [S/CSR; CSR(2), S(1), S/CSR(1)]

cf. *Elaeoselinum asclepium* (L.) Bertol. [1, 2, 3, 4, 5]; [MG(R), OG(R), PG(C), SG(R), MF(O), XF(O)]; [CS/CSR; C/CSR(1), CS/CSR(2)]

Eryngium campestre L. [3]; [MG(F), OG(C), SG(C), MF(R)]; [CS; C/CS(1), CS(3)]

Ferulago sylvatica (Besser) Rchb. subsp. *sylvatica* [1, 3, 4]; [SG(R), MF(O), XF(R)]; [CSR; CSR(1)]

Foeniculum vulgare Mill. [2, 3, 4, 5]; [OG(O)]; [S/CS; S/CS(1)]

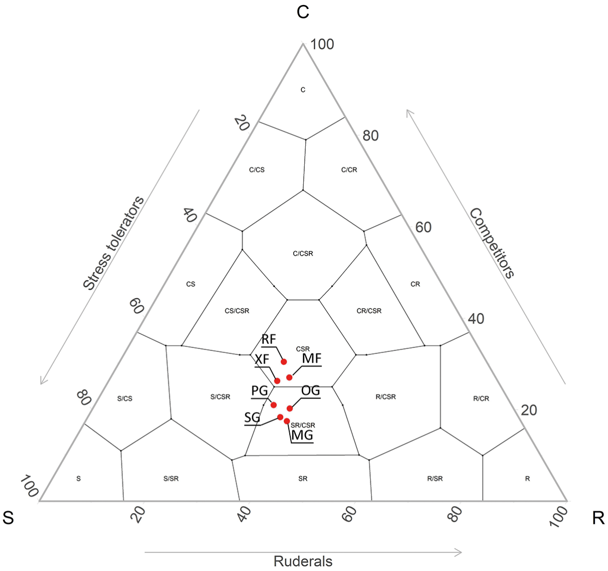

Fig. 6. CSR signature of each habitat type (SG: semi-natural grasslands; OG: old fields; MG: meadows; PG: pteridophyte stands; MF: mesic forests; XF: xerothermophytic forests; RF: riparian forests) after weighting taxa with their occurrence frequency. Arrows indicate increasing importance for each factor (competition, stress and disturbance) and letters represent competitive (C), stress tolerant (S) and ruderal (R) strategy.

Geocaryum capillifolium (Guss.) Coss. [1, 2, 3, 4, 5]; [MF(O), XF(O)]; [R/CR; R/CR(3)]

Helosciadium nodiflorum (L.) W. D. J. Koch [3, 5]; [RF(C)]; [CR; CR(3), R/CR(1)]

Malabaila aurea (Sm.) Boiss. [1, 2, 4]; [SG(O)]; [C/CSR; C/CSR(2), CR/CSR(1), CS/CSR(2)]

Oenanthe pimpinelloides L. s.l. [1, 2, 3, 5]; [MG(C), OG(O), SG(R), MF(O), XF(R)]; [C/CSR; C/CR(2), C/CSR(1), CR(1), CS(1), CS/CSR(1)]

Oenanthe silaifolia M. Bieb. [3, 5]; [MG(O)]; [S; S(2)]

Opopanax hispidus (Friv.) Griseb. [1, 2, 3, 4]; [OG(O), SG(O), MF(O), XF(R)]; [C; C(4)]

Orlaya daucoides (L.) Greuter [3, 4, 5]; [OG(R), SG(R)]; [R/CSR; R/CR(1), R/CSR(2), SR/CSR(1)]

Orlaya daucorlaya Murb. [1, 2, 3, 4, 5]; [MG(R), OG(F), PG(O), SG(C)]; [CS/CSR; C/CSR(2), CS(1), CS/CSR(1), CSR(1), S/CSR(1)]

Physospermum cornubiense (L.) DC. [1, 3, 4, 5]; [PG(O), MF(O), XF(R)]; [C/CSR; C/CSR(4), CR/CSR(1)]

Pimpinella tragium subsp. *polyclada* (Boiss. & Heldr.) Tutin [1, 2, 3, 4, 5]; [OG(O), SG(O), MF(ft)]; [CSR; CR/CSR(1), CSR(2), S/CSR(1)]

Scandix pecten-veneris L. [1, 2, 3, 4, 5]; [OG(O), SG(O)]; [CR; C/CR(1), CR(2), CR/CSR(2)]

Selinum silaifolium (Jacq.) Beck [1, 2, 3, 4]; [SG(R), MF(O), XF(O)]; [C/CSR; C/CSR(4)]

Seseli cf. *montanum* subsp. *tommasinii* (Rchb. f.) Arcang. [1, 2, 3, 4]; [OG(R), SG(O), XF(R)]; [S/CS; S/CS(4)]

Tordylium apulum L. [1, 2, 3, 4, 5]; [MG(R), OG(C), SG(C)]; [R/CSR; CR(2), CR/CSR(1), CSR(1), R/CR(1), R/CSR(2)]

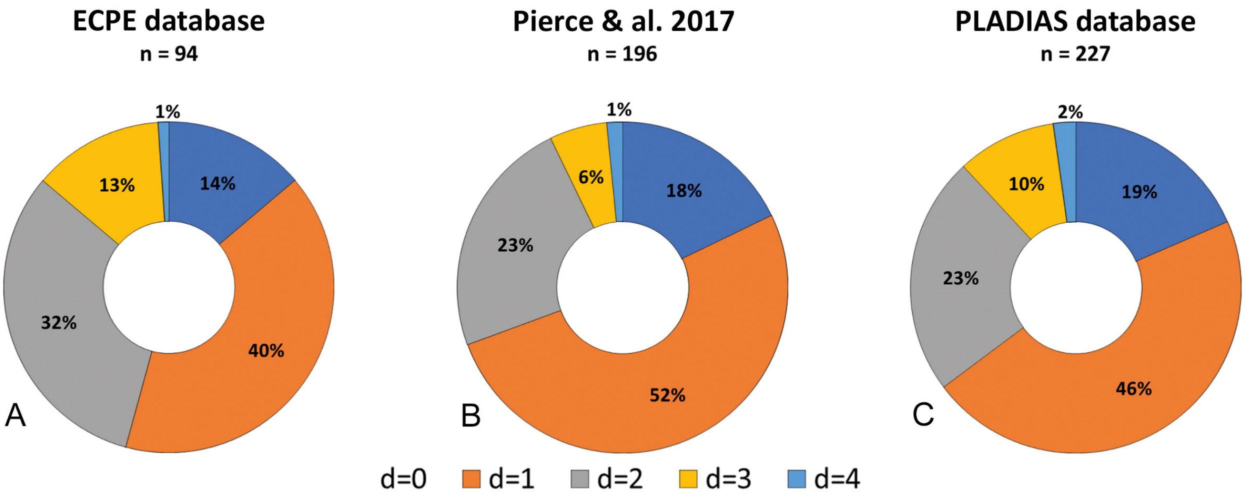

Fig. 7. Percent of *n* available taxa with CSR strategy distance *d* between present study and (A) ECPE database (Hodgson & al. 1995), (B) database of Pierce & al. (2017) and (C) PLADIAS database (Chytrý & al. 2021).

Tordylium maximum L. [3]; [OG(O)]; [CS/CSR; C/CSR(1), CS/CSR(2), CSR(1)]

Torilis africana Spreng. [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(O), MF(O), XF(O)]; [SR/CSR; R/CSR(1), SR/CSR(2)]

Torilis arvensis (Huds.) Link [3, 4, 5]; [MG(O), OG(O), PG(O), SG(R), MF(R), RF(ft), XF(R)]; [CSR; CSR(1), SR/CSR(2)]

Torilis japonica (Houtt.) DC. [3]; [SG(R)]; [SR/CSR; SR/CSR(1)]

Torilis nodosa (L.) Gaertn. [2, 3, 4, 5]; [OG(O), SG(R)]; [SR/CSR; SR/CSR(4)]

Araliaceae

Hedera helix L. subsp. *helix* [2, 3, 4]; [MG(O), OG(O), SG(O), MF(C), RF(C), XF(C)]; [CS/CSR; CS(1), CS/CSR(3), S/CSR(1)]

Aristolochiaceae

Aristolochia pallida Willd. subsp. *pallida* [1, 2, 3, 4]; [SG(O), MF(O), XF(O)]; [R/CR; R/CR(3), R/CSR(1)]

Asparagaceae

Asparagus acutifolius L. [1, 2, 3, 4, 5]; [OG(O), SG(C), MF(F), RF(O), XF(C)]; [S/SR; R/CR(1), S(1), S/SR(4)]

Asphodelaceae

Asphodeline liburnica (Scop.) Rchb. [1, 3]; [OG(R), MF(O), XF(R)]; [R/CR; CR(1), R/CR(3)]

Asphodeline lutea (L.) Rchb. [2, 3, 4]; [OG(R), SG(O), MF(R), XF(R)]; [R/CSR; R/CR(1), R/CSR(1), S/SR(1)]

Asphodelus ramosus L. subsp. *ramosus* [1, 3, 4, 5]; [SG(O), MF(O)]; [C/CS; C(2), S/CS(1)]

Asteraceae

Achillea pannonica Scheele [3]; [OG(R)]; [S/SR; S(1), S/CS(1), S/CSR(1), S/SR(1)]

Anthemis arvensis subsp. *incrassata* (Loisel.) Nyman [1, 2, 3, 4, 5]; [MG(R), OG(C), SG(F)]; [R; R(2), R/SR(1)]

Bellis perennis L. [1, 2, 3, 4, 5]; [MG(O), OG(F), SG(O), MF(O), XF(O)]; [R/CR; R(2), R/CR(2), R/SR(1)]

Carduus acanthoides L. [1, 5]; [MG(O), OG(C), SG(R)]; [S/CS; CS(3), S/CS(1)]

Carduus acicularis Bertol. [1, 2, 4]; [OG(O)]; [CR; CR(5)]

Carduus nutans L. subsp. *nutans* [1, 2, 3]; [OG(R), SG(O)]; [C/CR; C/CR(1)]

Carduus pycnocephalus L. [1, 2, 3, 4]; [OG(O), SG(O)]; [CR/CSR; CR(3), CR/CSR(1), CSR(1)]

Carlina corymbosa L. s.l. [3]; [MG(R), OG(O), SG(C), MF(ft), XF(R)]; [S/CS; C/CSR(2), CS(1), CS/CSR(1), S/CS(5), S/CSR(1)]

Carthamus lanatus L. [1, 2, 3, 4]; [MG(O), OG(C)]; [S/CS; S/CS(3), S/CSR(1)]

Centaurea salonitana Vis. [1, 2, 3, 4]; [OG(R), SG(O), XF(R)]; [C/CSR; C/CR(1), C/CS(1), CS/CSR(1)]

Centaurea solstitialis L. subsp. *solstitialis* [1, 2, 3, 4, 5]; [OG(C), SG(R)]; [CSR; CR/CSR(1), CSR(1), R/CSR(1), S/CSR(1), SR/CSR(1)]

Centaurea zuccariniana DC. [2, 3]; [SG(O)]; [S/SR; S(3), S/SR(2), SR/CSR(1)]

Chondrilla juncea L. [1, 2, 3, 4, 5]; [MG(O), OG(F), SG(R), MF(ft)]; [CR; CR(3), R/CR(1)]

Cichorium intybus L. [1, 2, 3, 4, 5]; [MG(F), OG(C), SG(O), MF(R), XF(R)]; [C/CSR; C/CSR(1), CR/CSR(1), CS/CSR(1), CSR(1)]

Crepis dioscoridis L. [1, 2, 4]; [OG(R), SG(O)]; [R/CSR; R/CR(5), R/CSR(3), SR/CSR(2)]

Crepis foetida L. subsp. *foetida* [1, 3, 4]; [OG(R), SG(O)]; [SR/CSR; R/CSR(1), S/CSR(3), SR/CSR(1)]

Crepis fraasii Sch. Bip. subsp. *fraasii* [1, 2, 3]; [MF(O), XF(O)]; [CR; CR(8), R/CR(2)]

Crepis neglecta L. subsp. *neglecta* [1, 2, 3, 4, 5]; [MG(R), OG(O), SG(O)]; [R/CR; R/CR(1)]

Crepis rubra L. [1, 2, 3, 4, 5]; [MG(R), OG(O), SG(O)]; [R/CR; R/CR(5), R/CSR(1)]

Crepis sancta (L.) Bornm. [1, 2, 3, 4]; [OG(R), SG(O)]; [R/CR; R/CR(1)]

Crepis setosa Haller f. [1, 2, 3, 4, 5]; [MG(O), OG(F), SG(R)]; [R/CR; R/CR(6)]

Crepis vesicaria L. subsp. *vesicaria* [3]; [OG(ft)]; [CR/CSR; CR(1), CR/CSR(1), CSR(2)]

Crepis zacintha (L.) Loisel. [1, 2, 3, 4, 5]; [OG(R), SG(O)]; [R/SR; R/CR(2), SR/CSR(1)]

Crupina crupinastrum (Moris) Vis. [2]; [SG(ft)]; [SR; R/SR(2), SR(1), SR/CSR(1)]

Crupina vulgaris Cass. [1, 2, 3, 4, 5]; [OG(R), SG(C)]; [R/CR; R(1), R/CR(1)]

Doronicum orientale Hoffm. [1, 3, 4]; [MF(O), XF(R)]; [CR; CR(4)]

Echinops sphaerocephalus L. subsp. *sphaerocephalus* [1]; [MG(ft), SG(F)]; [S/CS; CS(1), S/CS(3)]!

Filago germanica (L.) Huds. [1, 2, 3, 4, 5]; [MG(R), OG(O), SG(O)]; [SR; R/SR(3), SR(3)]

Hedypnois rhagadioloides (L.) F. W. Schmidt subsp. *rhagadioloides* [2, 4, 5]; [MG(R), SG(O)]; [R; R(5)]

Hieracium murorum L. s.l. [1]; [MF(R)]; [CR; CR(3), R/CR(2)]

Hypochaeris cretensis (L.) Bory & Chaub. [1, 2, 3, 4, 5]; [MG(O), OG(C), SG(F)]; [R/CSR; CR(1), CS(1), R/CR(4), R/CSR(2), S/CS(1), S/CSR(1), SR/CSR(1)]

Hypochaeris radicata L. [1, 2, 3, 4, 5]; [MG(F), OG(C), SG(O)]; [CR; C/CR(2), CR(3), R/CR(1)]

Lapsana communis subsp. *adenophora* (Boiss.) Rech. f. [1, 3]; [MF(O), RF(O)]; [R/CR; R/CR(4)]

Leontodon biscutellifolius DC. [3]; [MG(R), SG(R)]; [CSR; CR(1), CR/CSR(1), CSR(1), R/CSR(2), S/CSR(2), SR/CSR(3)]

Leontodon tuberosus L. [1, 2, 3, 4, 5]; [MG(F), OG(F), PG(C), SG(C), MF(O), XF(R)]; [CR; CR(5), R/CR(1), R/CSR(1)]

Onopordum illyricum subsp. *cardunculus* (Boiss.) Arènes [1, 2, 3]; [OG(R)]; [C/CS; C(1), C/CS(1)]

Pallenis spinosa (L.) Cass. subsp. *spinosa* [2, 3, 4, 5]; [OG(R), PG(O), SG(O)]; [CR/CSR; CR(1), CR/CSR(2), CSR(2)]!

Picris rhagadioloides (L.) Desf. [1, 4]; [SG(R), MF(ft)]; [SR; R/CSR(1), S/CSR(1), SR(3)]

Pilosella piloselloides (Vill.) Soják subsp. *piloselloides* [1, 2, 3, 4, 5]; [MG(F), OG(R), PG(C), SG(O), MF(O), XF(O)]; [R/CSR; CSR(1), R/CR(1), R/CSR(3), SR/CSR(2)]

Podospermum canum C. A. Mey. [1, 2, 3, 4]; [OG(O), SG(O)]; [SR/CSR; CSR(1), R/CSR(1), SR(1), SR/CSR(2)]

Ptilostemon strictus (Ten.) Greuter [1, 2, 3, 5]; [PG(O), MF(O), XF(R)]; [CR/CSR; C/CSR(2), CR/CSR(1), CSR(1)]

Reichardia picroides (L.) Roth [3, 5]; [SG(R)]; [R/CR; CR(1), R/CR(6)]

Rhagadiolus stellatus (L.) Gaertn. [1, 2, 3, 4]; [MG(R), OG(O), SG(F), XF(R)]; [R/CR; CR(1), R/CR(2), R/CSR(1)]

Scorzoneroides cichoriacea (Ten.) Greuter [1, 2, 4, 5]; [MG(R), SG(R), MF(F), XF(R)]; [R/CR; CR(1), R/CR(3)]

Tanacetum corymbosum subsp. *cinereum* (Griseb.) Grierson [3]; [(ft)]; [CSR; CSR(4)]

Tragopogon porrifolius subsp. *eriospermus* (Ten.) Greuter [1, 2, 3, 4, 5]; [MG(R), OG(O), SG(F)]; [R/CSR; R/CR(1), R/CSR(2)]

Tragopogon pratensis L. [2]; [MG(O)]; [SR/CSR; R/CSR(1), S/CSR(2), SR/CSR(2)]

Tragopogon samaritani Boiss. [1, 3, 4, 5]; [OG(R), SG(O)]; [CSR; CR/CSR(1), CS/CSR(1), CSR(1)]

Urospermum picroides (L.) F. W. Schmidt [1, 2, 4]; [OG(R), SG(O)]; [R/CR; CR(1), R/CR(4), R/CSR(1)]

Xeranthemum inapertum (L.) Mill. [4]; [OG(R), SG(O)]; [SR; R/SR(2), SR(3)]

Betulaceae

Alnus glutinosa (L.) Gaertn. subsp. *glutinosa* [3, 5]; [MF(ft), RF(C)]; [CS/CSR; CS/CSR(5)]

Carpinus orientalis Mill. subsp. *orientalis* [1, 2, 3, 4, 5]; [MG(O), OG(R), SG(O), MF(O), XF(C)]; [S/SR; S/CS(1), S/SR(4)]

Corylus avellana L. [3, 4]; [MF(O), XF(O)]; [CS/CSR; CS(1), CS/CSR(3), CSR(1)]

Ostrya carpinifolia Scop. [2, 3, 4, 5]; [MF(R), XF(O)]; [S/CSR; S/CS(2), S/CSR(3)]

Boraginaceae

Aegonychon purpurocaeruleum (L.) Holub [2, 5]; [MF(R), XF(R)]; [SR/CSR; S/CSR(1), SR/CSR(4)]

Anchusa undulata L. subsp. *undulata* [1, 2, 4, 5]; [OG(O), SG(O)]; [R/CR; CR(1), R/CR(3), R/CSR(1)]

Anchusella cretica (Mill.) Bigazzi & al. [1, 2, 3, 4, 5]; [MG(R), OG(F), SG(F)]; [R/CR; R/CR(4)]

Cynoglossum columnae Ten. [2, 4]; [OG(R), SG(R)]; [CR/CSR; CR(3), CSR(3)]

Cynoglossum creticum Mill. [3, 5]; [MG(ft), OG(R), SG(R)]; [R/CSR; CSR(1), R/CR(1)]

Echium italicum subsp. *biebersteinii* (Lacaita) Greuter & Burdet [1, 2, 3, 4, 5]; [MG(R), OG(F), SG(O)]; [C; C(3), C/CR(1)]

Echium plantagineum L. [3]; [MG(ft), OG(R)]; [S/SR; S(1), S/CSR(1), S/SR(1)]

Myosotis arvensis (L.) Hill [1, 2, 3, 4, 5]; [OG(O), SG(R), MF(R), XF(R)]; [R/SR; R(5), R/CSR(1), R/SR(3), SR(1)]

Myosotis ramosissima Rochel subsp. *ramosissima* [1, 2, 3, 5]; [OG(O), SG(O)]; [R; R(2)]

Symphytum bulbosum K. F. Schimp. [1, 3]; [PG(O), MF(O)]; [CR; CR(5)]

Brassicaceae

Aethionema saxatile subsp. *graecum* (Boiss. & Spruner) Hayek [1, 2, 3, 4]; [SG(O)]; [S/SR; S(1), S/SR(1), SR(1)]

Alyssum montanum subsp. *repens* (Baumg.) Schmalh. [1, 3, 5]; [SG(O)]; [SR; R(2), S(2), S/SR(1)]

Alyssum simplex Rudolphi [1, 2, 3, 4, 5]; [OG(O), SG(F)]; [S/SR; S(1), S/SR(1)]

Arabis collina Ten. [3]; [(ft)]; [S; S(3)]
Arabis glabra (L.) Bernh. [1, 2, 3]; [OG(O), SG(R)]; [SR/CSR; S/CSR(1), SR(1), SR/CSR(2)]
Arabis sagittata (Bertol.) DC. [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(O), SG(C), MF(O), XF(R)]; [R/SR; R(2), R/SR(3), SR(4)]
Berteroa mutabilis (Vent.) DC. [1, 2, 3, 4, 5]; [MG(R), OG(C), SG(O), RF(ft)]; [S/CSR; CSR(2), S/CSR(2), SR/CSR(1)]
Bunias erucago L. [1, 2, 4, 5]; [OG(O), SG(F)]; [CR; CR(1), R/CR(2), R/CSR(1)]
Capsella bursa-pastoris (L.) Medik. [1, 2, 3, 4, 5]; [MG(ft), OG(F), SG(O), RF(ft)]; [R/CR; R(3), R/CR(4)]
Cardamine graeca L. [1, 2, 3, 4, 5]; [MF(R), XF(O)]; [R; R(2)]
Cardamine hirsuta L. [1, 5]; [OG(O), PG(C), MF(R), RF(ft)]; [R/CR; R/CR(5)]
Draba muralis L. [1, 2, 3]; [MG(R), OG(O), SG(R)]; [R; R(3)]
Erysimum cephalonicum Polatschek [2, 3, 4, 5]; [SG(O), MF(ft)]; [S/SR; S(3), S/SR(5)]
Erysimum microstylum Hausskn. [1, 2, 3, 4, 5]; [SG(O)]; [S/SR; S/SR(1)]
Fibigia clypeata (L.) Medik. subsp. *clypeata* [1, 4]; [SG(R)]; [S/CS; S/CS(2), S/SR(1)]
Rorippa thracica (Griseb.) Fritsch [2, 3]; [MG(O)]; [R/SR; R(2), R/SR(1), S(1), SR(1)]
Sisymbrium officinale (L.) Scop. [1, 2, 3, 4]; [OG(O), SG(R)]; [R/CSR; CR(1), R/CR(2), R/CSR(2), SR/CSR(2)]

Buxaceae

Buxus sempervirens L. [3]; [(ft)]; [S; S(1)]

Caesalpiniaceae

Cercis siliquastrum L. [2, 3, 5]; [OG(R), SG(O), MF(R), RF(O), XF(O)]; [CS; C/CSR(1), CS(2), CS/CSR(1)]

Campanulaceae

Campanula ramosissima Sm. [2, 3, 4]; [OG(R), SG(R)]; [R; R(4), R/CR(1)]
Campanula spatulata subsp. *spruneriana* (Hampe) Hayek [1, 2, 3, 4, 5]; [MG(ft), OG(O), PG(C), SG(O), MF(C), XF(O)]; [R/SR; R(1), R/SR(1), SR(1)]
Campanula trachelium L. s.l. [1, 2, 3, 4, 5]; [MF(O), XF(R)]; [CR/CSR; C/CSR(1), CR(1), CR/CSR(2), CSR(1)]
Legousia falcata (Ten.) Janch. [3]; [(ft)]; [R/CR; R(1), R/CR(3), R/SR(1)]

Caprifoliaceae

Sambucus nigra L. [3]; [RF(C)]; [C/CSR; C/CR(2), C/CS(1), C/CSR(2)]

Caryophyllaceae

Arenaria leptoclados (Rchb.) Guss. [1, 2, 3, 4, 5]; [OG(F), SG(C)]; [S; S(1)]
Cerastium brachypetalum subsp. *roeseri* (Boiss. & Heldr.) Nyman [1, 2, 3, 4, 5]; [OG(O), SG(C)]; [R/SR; R(5), R/SR(1), S(1), S/SR(1), SR(1)]
Dianthus viscidus Bory & Chaub. [1, 2, 3, 5]; [MG(O), OG(R), PG(O), SG(R), MF(R)]; [S/SR; S(1), S/SR(5), SR(2)]
Herniaria incana Lam. [1, 3]; [OG(R)]; [S; S(5)]
Lychnis coronaria (L.) Desr. [3]; [PG(C), MF(O)]; [C/CSR; C/CR(1), CR(1), CS/CSR(1), S/CS(1)]
Moenchia mantica (L.) Bartl. [1, 2, 3, 4, 5]; [MG(C), OG(F), SG(R)]; [S; S(4), S/SR(1)]
Petrorhagia dubia (Raf.) G. López & Romo [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(R)]; [S/SR; S(2), S/SR(4), SR(1)]
Petrorhagia prolifera (L.) P. W. Ball & Heywood [1, 2, 3, 4, 5]; [MG(R), OG(C), PG(O), SG(O)]; [SR; SR(1)]
Petrorhagia saxifraga (L.) Link [1, 2, 3, 4, 5]; [SG(C)]; [S; S(4)]
Silene gallinyi Rchb. [1, 2, 3, 4, 5]; [MG(O), OG(F), SG(O)]; [SR; R(1), R/CR(1), R/SR(1), S/SR(3), SR/CSR(1)]
Silene graeca Boiss. & Spruner [2, 3, 4]; [OG(R), SG(O)]; [R/CR; R(5), R/CR(3), SR(2)]
Silene heldreichii Boiss. [1, 2, 4]; [OG(O), SG(O)]; [SR; S/SR(1), SR(2), SR/CSR(2)]
Silene latifolia Poir. [3]; [OG(R), MF(ft)]; [CR/CSR; CR(2), CS/CSR(1)]
Silene niederi Boiss. [1, 2, 3, 4, 5]; [OG(O), SG(R), MF(R)]; [S/CSR; R/CSR(1), S/CSR(1), S/SR(1)]
Silene paradoxa L. [1, 3]; [SG(R)]; [S/CS; S(1), S/CS(3), S/CSR(1)]
Silene ungeri Fenzl [1, 2, 3, 4]; [OG(O), SG(O)]; [R/SR; R(1), R/CR(1), S/SR(1), SR(2)]
Silene viridiflora L. [1, 2, 3, 5]; [PG(C), MF(F), XF(O)]; [CSR; CSR(1), R/CSR(1), S/CSR(3)]
Silene vulgaris (Moench) Garcke s.l. [1, 2, 3, 4]; [OG(O), SG(ft), XF(R)]; [R/CSR; R/CR(3), R/CSR(2), SR/CSR(1)]
Stellaria media (L.) Vill. [1, 2]; [MG(R), OG(R), SG(R), MF(R), XF(R)]; [R; R(1)]

Celastraceae

Euonymus europaeus L. [1, 2, 3, 4, 5]; [MG(R), OG(R), SG(R), MF(O), RF(C), XF(F)]; [CSR; CR/CSR(1), CSR(4)]

Cistaceae

Cistus creticus subsp. *eriocephalus* (Viv.) Greuter & Burdet [2, 3, 5]; [MG(R), OG(R), SG(O), MF(R), XF(R)]; [S; S(3)]
Fumana arabica (L.) Spach [3]; [SG(R)]; [S; S(4)]
Helianthemum nummularium (L.) Mill. subsp. *nummularium* [1, 2, 3, 4]; [OG(R), SG(O)]; [S; S(4)]
Helianthemum salicifolium (L.) Mill. [3, 4, 5]; [OG(O), SG(C)]; [S/SR; S(1), S/SR(2)]

Colchicaceae

Colchicum haynaldii Heuff. [1, 3, 4, 5]; [MG(O), OG(R), SG(O), MF(R), XF(R)]; [CR; C/CR(2), CR(2)]

Convolvulaceae

Convolvulus arvensis L. [1, 2, 3, 4, 5]; [MG(C), OG(C), SG(O)]; [R/CR; R/CR(3), R/CSR(1)]

Convolvulus cantabrica L. [1, 2, 3, 4, 5]; [OG(O), SG(C)]; [S/SR; S/CS(2), S/CSR(1), S/SR(2)]
Convolvulus elegantissimus Mill. [1, 2, 4]; [OG(R), SG(O)]; [S/CS; S(1), S/CS(3), S/CSR(1)]
Cornaceae
Cornus mas L. [1, 2, 3, 4, 5]; [MG(O), OG(R), PG(C), SG(O), MF(C), XF(C)]; [SR/CSR; CSR(1), R/CSR(1), SR/CSR(3)]
Cornus sanguinea subsp. *australis* (C. A. Mey.) Jáv. [3, 4, 5]; [SG(R), MF(O), RF(C), XF(O)]; [S/CSR; CS/CSR(1), S/CSR(4)]
Crassulaceae
Sedum cepaea L. [3, 5]; [XF(R)]; [S/SR; S(1), S/SR(4)]
Sedum rubens L. [1, 2, 3, 4, 5]; [OG(R), SG(F)]; [S; S(8)]
Cyperaceae
Carex caryophyllea Latourr. [1, 2, 4, 5]; [MG(O), SG(O), MF(R)]; [S/SR; S/SR(5)]
Carex distachya Desf. [1, 2, 3, 4, 5]; [MG(R), OG(R), PG(C), SG(O), MF(O), RF(O), XF(O)]; [S/SR; S/CS(4), S/CSR(1), S/SR(4)]
Carex distans L. [5]; [MG(R)]; [S/CSR; S/CSR(2), S/SR(1)]
Carex divisa Huds. [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(R), MF(R), XF(R)]; [S; S(5)]
Carex flacca subsp. *serrulata* (Spreng.) Greuter [1, 2, 3, 4, 5]; [MG(O), PG(C), SG(F), MF(F), XF(O)]; [S/CS; S(2), S/CSR(2)]
Carex halleriana Asso subsp. *halleriana* [1, 2, 3, 4, 5]; [SG(O), MF(R), XF(O)]; [S/SR; S(1), S/CS(2), S/CSR(2), S/SR(6)]
Carex leersii F. W. Schultz [1, 2, 3, 4, 5]; [MG(O), OG(F), MF(O), XF(O)]; [S/CSR; S/CSR(4), S/SR(2)]
Carex muricata L. subsp. *muricata* [1, 3, 5]; [MG(O), OG(R), MF(R)]; [S/CSR; S/CSR(3)]
Carex pendula Huds. [3]; [RF(O)]; [C/CS; C/CS(1)]
Carex remota L. [3]; [RF(C)]; [SR/CSR; SR/CSR(5)]
Dioscoreaceae
Dioscorea communis (L.) Caddick & Wilkin [2, 4, 5]; [SG(R), MF(O), RF(C), XF(O)]; [CR; CR(4)]
Dipsacaceae
Knautia integrifolia (L.) Bertol. subsp. *integrifolia* [1, 2, 3, 4, 5]; [OG(O), SG(O)]; [CSR; CSR(3), R/CSR(1), SR/CSR(1)]
Knautia integrifolia subsp. *mimica* (Borbás) Greuter [1, 2, 4, 5]; [OG(R), SG(R)]; [CR/CSR; CR(1), SR/CSR(1)]
Lomelosia brachiata (Sm.) Greuter & Burdet [3, 4, 5]; [OG(ft), SG(O)]; [S/CSR; CR/CSR(1), CSR(1), S/CSR(3)]
Scabiosa tenuis Boiss. [1, 2, 3, 4, 5]; [OG(F), PG(O), SG(C), XF(R)]; [R/CSR; CR(1), R/CR(1), R/CSR(3)]
Euphorbiaceae
Euphorbia amygdaloides L. subsp. *amygdaloides* [2, 5]; [MF(R), XF(R)]; [R/CSR; R/CSR(2), SR/CSR(2)]
Euphorbia exigua L. subsp. *exigua* [5]; [SG(R)]; [S/SR; S(1), SR(1)]
Euphorbia falcata L. subsp. *falcata* [2, 3, 4, 5]; [OG(R), SG(O)]; [SR; R/SR(1), S/SR(1), SR(3)]
Euphorbia helioscopia L. [1, 2, 3, 4, 5]; [MG(R), OG(O), SG(O)]; [R/SR; R/SR(1)]
Euphorbia myrsinites L. [4]; [OG(R), SG(O)]; [S/CS; S(1), S/CS(4)]
Euphorbia phymatosperma subsp. *cernua* (Coss. & Durieu) Vindt [1, 2, 3, 4]; [OG(R), SG(O), MF(R), XF(O)]; [SR; R/SR(5), SR(4)]
Fabaceae
Anthyllis vulneraria subsp. *bulgarica* (Sagorski) Cullen [2, 4]; [SG(R)]; [CS/CSR; C/CSR(2), CS/CSR(2), CSR(1)]
Astragalus glycyphyllos L. subsp. *glycyphyllos* [5]; [PG(O), MF(O)]; [CR/CSR; C/CSR(1), CR(1), CR/CSR(1), CS/CSR(1)]
Bituminaria bituminosa (L.) C. H. Stirt. [2, 3, 4, 5]; [SG(O), XF(R)]; [S/CSR; CS/CSR(1), S/CSR(2)]
Colutea arborescens L. subsp. *arborescens* [1, 3, 4]; [MF(R), XF(R)]; [CS/CSR; CS/CSR(1), CSR(2), S/CS(1), S/CSR(1)]
Coronilla scorpioides (L.) W. D. J. Koch [1, 2, 4]; [OG(R), SG(F)]; [S; S(4)]
Dorycnium herbaceum Vill. [1, 2, 3, 4, 5]; [MG(ft), SG(R)]; [SR; S/SR(1), SR(3), SR/CSR(1)]
Dorycnium hirsutum (L.) Ser. [2, 3, 5]; [PG(C), MF(O), XF(O)]; [S/CSR; S/SR(2), SR(1), SR/CSR(1)]
Hippocrepis ciliata Willd. [3, 4]; [SG(O)]; [S/SR; S(3), S/SR(3)]
Hippocrepis emerus subsp. *emeroides* (Boiss. & Spruner) Lassen [2, 3, 4, 5]; [MF(R), XF(O)]; [S/CS; S/CS(3), S/SR(1)]
Hymenocarpos circinnatus (L.) Savi [3, 4, 5]; [MG(R), OG(R), SG(O)]; [SR/CSR; R/CR(1), S/SR(1), SR/CSR(4)]
Lathyrus aphaca L. [1, 2, 3, 5]; [MG(O), OG(R), PG(O), SG(O), MF(O), XF(O)]; [R/SR; R(2), R/CSR(1), R/SR(1), SR(1)]
Lathyrus cicera L. [1, 2, 3, 4, 5]; [MG(R), OG(R), SG(O)]; [S/SR; S(1), S/CSR(1), S/SR(2)]
Lathyrus digitatus (M. Bieb.) Fiori [1, 2, 3]; [XF(O)]; [SR/CSR; CSR(2), SR/CSR(2)]
Lathyrus inconspicuus L. [1, 2, 3, 4, 5]; [MG(O), OG(R), PG(C), SG(O), MF(O), XF(R)]; [S/SR; S(1), S/SR(3), SR(1)]
Lathyrus laxiflorus (Desf.) Kuntze [1, 2, 3, 4, 5]; [PG(ft), MF(C), XF(O)]; [SR/CSR; SR/CSR(2)]
Lathyrus niger (L.) Bernh. [1, 3, 4, 5]; [PG(C), MF(O)]; [CSR; CSR(1), S/CSR(1), SR/CSR(2)]
Lathyrus nissolia L. [1, 2, 3, 4, 5]; [MG(O), PG(O), SG(R)]; [SR/CSR; SR(1), SR/CSR(3)]
Lathyrus setifolius L. [1, 3, 4]; [SG(R)]; [S/SR; S(1), S/SR(2)]
Lathyrus venetus (Mill.) Wohlf. [1, 2, 3, 4]; [MF(O), XF(O)]; [CSR; CR/CSR(1), CSR(3), R/CSR(1)]

Lotus corniculatus L. [1, 2, 3, 4, 5]; [MG(F), OG(O), PG(C), SG(O), MF(R), XF(O)]; [R/SR; R/CR(2), R/SR(2), SR/CSR(1)]

Medicago arabica (L.) Huds. [1, 2, 3, 4, 5]; [MG(O), OG(C), SG(R), MF(R)]; [SR; R/SR(1), SR(2), SR/CSR(1)]

Medicago lupulina L. [1, 3, 4, 5]; [MG(O), OG(O), SG(O), RF(ft), XF(R)]; [S/SR; S/CSR(1), S/SR(4)]

Medicago minima (L.) Bartal. [1, 2, 3, 4, 5]; [MG(R), OG(C), PG(O), SG(C)]; [SR; S/SR(2), SR(5)]

Medicago orbicularis (L.) Bartal. [1, 2, 3, 4, 5]; [MG(O), OG(C), SG(F)]; [SR; SR(5), SR/CSR(1)]

Medicago polymorpha L. [1, 2, 3, 4, 5]; [MG(R), OG(O), SG(R)]; [SR; S/CSR(1), S/SR(3), SR/CSR(2)]

Medicago rigidula (L.) All. [1, 2, 3, 4, 5]; [MG(R), OG(C), SG(C)]; [SR; S/SR(3), SR(3)]

Medicago sativa subsp. *falcata* (L.) Arcang. [1, 2, 3, 4, 5]; [OG(F), SG(O)]; [S/SR; S/SR(5), SR(1)]

Medicago sativa L. subsp. *sativa* [3]; [OG(O)]; [S/SR; S/CS(1), S/SR(3)]

Melilotus officinalis (L.) Lam. [1]; [MF(ft)]; [S/CS; S/CS(1)]

Onobrychis aequidentata (Sm.) d'Urv. [1, 4]; [SG(O)]; [S/SR; S/CS(2), S/CSR(2), S/SR(1)]

Onobrychis alba (Waldst. & Kit.) Desv. subsp. *alba* [1, 4]; [SG(O)]; [S/CS; S(1), S/CS(4)]

Onobrychis caput-galli (L.) Lam. [4, 5]; [OG(R), SG(F)]; [S/SR; S/SR(5), SR/CSR(1)]

Onobrychis pindicola Hausskn. [4]; [SG(O)]; [S/CS; S/CS(2), S/SR(1)]

Ononis reclinata L. [3]; [SG(R)]; [SR; R/SR(1), S/SR(2), SR(2)]

Ononis spinosa L. s.l. [1, 3, 4, 5]; [MG(F), OG(O), SG(O)]; [R/CSR; R/CR(1), R/CSR(2), SR/CSR(1)]

Ornithopus compressus L. [1, 2, 3, 5]; [MG(O), OG(R), PG(C), SG(ft), MF(O)]; [R/CSR; R/CSR(2), SR(1), SR/CSR(3)]

Scorpiurus muricatus L. [1, 2, 3, 5]; [MG(R), OG(R), SG(O)]; [R/CR; R(2), R/CR(3)]

Securigera securidaca (L.) Degen & Dörfl. [2, 5]; [SG(R)]; [R/CR; CR(1), CR/CSR(1), R/CR(2)]

Trifolium angustifolium L. [1, 2, 3, 4, 5]; [MG(F), OG(F), PG(C), SG(C), XF(R)]; [S/SR; S/SR(4)]

Trifolium arvense L. [3, 5]; [MG(R), PG(C)]; [S/SR; S(1), S/SR(3), SR(1)]

Trifolium campestre Schreb. [1, 2, 3, 5]; [MG(C), OG(C), PG(C), SG(C), MF(O)]; [SR; R/SR(1), S/SR(2), SR(2)]

Trifolium cherleri L. [1, 2, 3, 4, 5]; [MG(R), OG(F), PG(O), SG(F)]; [S/SR; S/SR(6), SR(3)]

Trifolium dalmaticum Vis. [1, 2, 3, 4, 5]; [OG(C), PG(C), SG(C)]; [S/SR; S/SR(5), SR(4), SR/CSR(1)]

Trifolium grandiflorum Schreb. [1, 2, 3]; [SG(R), XF(R)]; [S/SR; S/SR(3), SR(1)]

Trifolium heldreichianum Hausskn. [1, 3]; [MF(O)]; [SR/CSR; S/CSR(2), SR/CSR(3)]

Trifolium hirtum All. [3]; [OG(R), PG(O)]; [S/CSR; S/CSR(4)]

Trifolium lappaceum L. [1, 3, 4, 5]; [MG(R), SG(O)]; [S/SR; S(3), S/SR(3)]

Trifolium ochroleucon subsp. *roseum* (C. Presl) Lassen [1, 2, 3, 4, 5]; [MG(O), PG(O), MF(F), XF(R)]; [CSR; CSR(4), R/CSR(1), S/CSR(4), S/SR(1)]

Trifolium patulum Tausch [1, 3, 5]; [MF(O), XF(R)]; [S/CSR; S/CSR(3), SR(1), SR/CSR(1)]

Trifolium physodes M. Bieb. [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(O), MF(O), XF(O)]; [S/CSR; CR/CSR(2), S(3), S/CS(1), S/CSR(4), S/SR(1), SR/CSR(1)]

Trifolium pignantii Fauché & Chaub. [1, 3]; [MF(O), XF(R)]; [SR/CSR; S/CSR(3), SR/CSR(6)]

Trifolium pratense L. [1, 2, 3, 4, 5]; [MG(F), OG(C), PG(C), SG(R), MF(R), XF(R)]; [SR/CSR; SR/CSR(4)]

Trifolium repens L. [1, 2, 3, 4, 5]; [MG(F), OG(F), PG(O), SG(R)]; [R/CR; R(1), R/CR(3), SR/CSR(1)]

Trifolium resupinatum L. subsp. *resupinatum* [1, 2, 3, 5]; [MG(O), OG(O), SG(ft)]; [SR; S/CSR(2), S/SR(1), SR(7)]

Trifolium scabrum L. [1, 3, 4, 5]; [OG(R), SG(O)]; [S/SR; S(2), S/SR(3)]

Trifolium stellatum L. [1, 2, 3, 4]; [OG(O), SG(F)]; [S/CSR; S/CSR(3), S/SR(1), SR(2), SR/CSR(1)]

Trifolium strictum L. [1]; [MF(ft)]; [SR; S/SR(1), SR/CSR(3)]

Trifolium subterraneum L. [1, 2, 3, 4, 5]; [MG(O), OG(C), PG(C), SG(O), MF(R), XF(R)]; [SR/CSR; R/CSR(2), SR/CSR(3)]

Trifolium tenuifolium Ten. [1, 3, 5]; [MG(O), PG(C)]; [S/SR; S/SR(3), SR(2)]

Trifolium vesiculosum Savi [3]; [PG(C)]; [S/CSR; S/CSR(3), SR/CSR(1)]

Trigonella gladiata M. Bieb. [1, 2, 4, 5]; [SG(O)]; [S/SR; S/SR(3), SR(1)]

Vicia bithynica (L.) L. [4]; [MG(R), SG(R)]; [SR/CSR; SR/CSR(2)]

Vicia cassubica L. [1, 3, 5]; [PG(O), MF(O)]; [CSR; CSR(4), R/CSR(1)]

Vicia grandiflora Scop. [1, 2, 3, 5]; [MG(R), OG(R), PG(O), SG(R), MF(F), XF(O)]; [R/CSR; CSR(1), R/CR(1), R/CSR(2), SR/CSR(1)]

Vicia hirsuta (L.) Gray [1, 2, 3, 4, 5]; [PG(O), SG(R), MF(O), XF(R)]; [SR; S/SR(2), SR(1)]

Vicia hybrida L. [2, 3]; [OG(R), SG(R)]; [S/SR; S(1), S/CSR(1), S/SR(1)]

Vicia lathyroides L. [1, 2, 3, 4]; [MG(R), OG(R), PG(C), SG(R), XF(R)]; [S/SR; S/SR(4)]

Vicia tetrasperma (L.) Schreb. [1, 3, 5]; [MG(O), PG(O), SG(R), MF(R)]; [R/SR; R(2), R/SR(2), SR(1)]

Vicia villosa subsp. *varia* (Host) Corb. [1, 2, 3, 4, 5]; [MG(F), OG(C), SG(C), MF(O), XF(O)]; [SR/CSR; CSR(1), R/CSR(1), SR/CSR(3)]

Fagaceae

Castanea sativa Mill. [3, 4]; [MF(O)]; [CS/CSR; CS(1), CS/CSR(4)]

Quercus cerris L. [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(C), SG(O), MF(C), RF(O), XF(C)]; [S/CSR; CS/CSR(2), S/CS(1), S/CSR(2)]

Quercus coccifera L. [2, 5]; [MG(O), OG(O), SG(F), MF(F), RF(C), XF(C)]; [S; S(2), S/CS(2)]

Quercus frainetto Ten. [1, 2, 4, 5]; [MG(O), OG(O), PG(C), SG(R), MF(C), XF(O)]; [C/CSR; C/CR(1), CR(1), S/CS(1)]

Quercus ithaburensis subsp. *macrolepis* (Kotschy) Hedge & Yalt. [2, 3]; [SG(O)]; [S/CS; S/CS(5)]

Quercus pubescens Willd. [1, 2, 3, 4, 5]; [MG(F), OG(O), PG(C), SG(F), MF(O), RF(C), XF(C)]; [S/CS; S/CS(5)]

Quercus robur subsp. *pedunculiflora* (K. Koch) Menitsky [3, 5]; [MF(ft)]; [S/CS; CS(2), S/CS(3)]

Quercus trojana Webb subsp. *trojana* [1, 2, 3, 4]; [OG(R), SG(O), MF(O), XF(O)]; [S/CS; S/CS(10)]

Gentianaceae

Blackstonia perfoliata (L.) Huds. subsp. *perfoliata* [5]; [SG(R)]; [SR; SR(2), SR/CSR(1)]

Centaurium erythraea subsp. *rumelicum* (Velen.) Melderis [3, 5]; [MG(O), PG(C)]; [R/CSR; R/CR(1), R/CSR(1), R/SR(1), SR/CSR(2)]

Centaurium pulchellum (Sw.) Druce [4]; [SG(ft)]; [S/SR; S(3), SR(1)]

Geraniaceae

Geranium columbinum L. [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(C), SG(C), MF(R)]; [R/CSR; R/CSR(2)]

Geranium dissectum L. [1, 2, 3, 4, 5]; [MG(C), OG(C), SG(R), MF(R)]; [SR; S/CSR(1), SR(3), SR/CSR(2)]

Geranium lanuginosum Lam. [1, 4, 5]; [SG(R), MF(O), XF(R)]; [CR/CSR; CR(1), CR/CSR(1), CSR(2), R/CR(1)]

Geranium lucidum L. [1, 2, 3, 4, 5]; [MG(R), SG(R), MF(R), XF(O)]; [R; R(4)]

Geranium molle L. [1, 2, 3, 4, 5]; [MG(R), OG(F), SG(O), MF(R), XF(R)]; [R/CR; CR(1), R(4), R/CR(3), S/SR(1)]

Geranium purpureum Vill. [1, 2, 3, 4, 5]; [SG(O), MF(R), XF(R)]; [R/CSR; R/CR(3), SR/CSR(2)]

Geranium robertianum L. [1, 2, 3, 5]; [SG(R), MF(R), RF(ft), XF(R)]; [R/CR; R/CR(2)]

Geranium rotundifolium L. [3, 4, 5]; [SG(O), MF(R), RF(ft)]; [R/CR; CR(2), R/CR(2)]

Hippocastanaceae

Aesculus hippocastanum L. [3]; [XF(R)]; [C/CR; C/CR(1)]

Hyacinthaceae

Muscari cf *armeniacum* Baker [1, 2, 5]; [OG(R), SG(O), MF(R), XF(R)]; [R/CR; R/CR(4)]

Muscari comosum (L.) Mill. [1, 2, 3, 4]; [OG(O), PG(C), SG(F), MF(O), XF(O)]; [C/CR; C/CR(3), CR(1)]

Ornithogalum narbonense L. [5]; [SG(R), MF(R)]; [C/CSR; C/CR(1), C/CSR(1)]

Hypericaceae

Hypericum perforatum subsp. *veronense* (Schrank) Ces. [1, 2, 3, 4, 5]; [MG(F), OG(C), PG(C), SG(F), MF(O), XF(R)]; [S/SR; S(3), SR(2)]

Hypericum rumeliacum Boiss. subsp. *rumeliacum* [2]; [SG(O)]; [S/SR; S(1), S/SR(1)]

Hypericum spruneri Boiss. [1, 2, 3, 4, 5]; [OG(R), PG(O), SG(F), MF(R), XF(O)]; [S/SR; S/CS(1), S/SR(3)]

Iridaceae

Iris sintenisii Janka subsp. *sintenisii* [3, 5]; [SG(R), MF(R), XF(R)]; [S/CS; S/CS(2)]

Juglandaceae

Juglans regia L. [3, 4, 5]; [MF(O), RF(C), XF(O)]; [C/CR; C/CR(3), C/CSR(2)]

Juncaceae

Juncus gerardi Loisel. subsp. *gerardi* [3]; [MG(ft)]; [S; S(2)]

Luzula campestris (L.) DC. subsp. *campestris* [1, 5]; [MG(F), OG(R), PG(C), SG(O), MF(R)]; [SR; R/SR(1), SR(3)]

Luzula forsteri (Sm.) DC. [1, 2, 3, 4, 5]; [MF(C), XF(C)]; [S/CSR; S/CSR(4)]

Lamiaceae

Ajuga chamaepitys (L.) Schreb. subsp. *chamaepitys* [2, 3, 4, 5]; [OG(R), SG(O)]; [S/SR; S(1), S/SR(4)]

Ajuga genevensis L. [2, 3]; [OG(R)]; [CSR; CSR(1), R/CSR(2), S/CSR(1)]

Ajuga reptans L. [3, 5]; [MF(R), RF(O), XF(R)]; [CSR; CR/CSR(1), CSR(4)]

Clinopodium vulgare subsp. *orientale* Bothmer [1, 2, 4, 5]; [MG(R), OG(O), PG(C), SG(R), MF(O), XF(O)]; [SR/CSR; SR/CSR(1)]

Lamium maculatum L. [3]; [RF(O)]; [CSR; CSR(2), R/CR(1), R/CSR(2)]

Marrubium peregrinum L. [1, 2, 3, 4, 5]; [OG(O)]; [S/CSR; CS/CSR(2), S/CS(1), S/CSR(1)]

Melissa officinalis subsp. *altissima* (Sm.) Arcang. [2, 5]; [RF(O), XF(R)]; [CR/CSR; CR/CSR(3)]

Melittis melissophyllum subsp. *albida* (Guss.) P. W. Ball [1, 2, 4, 5]; [MF(F), XF(F)]; [CR/CSR; CR/CSR(4)]

Micromeria juliana (L.) Rchb. [1, 2, 3, 4, 5]; [SG(F), XF(R)]; [S; S(5)]

Origanum vulgare subsp. *hirtum* (Link) A. Terracc. [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(F), MF(R), XF(R)]; [S/CSR; S/CSR(2), S/SR(1), SR(1)]

Phlomis fruticosa L. [1, 2, 4]; [OG(F), SG(C), XF(O)]; [CS/CSR; C/CSR(1), CS(1), CS/CSR(1), S/CS(1), S/CSR(1)]

Prunella laciniata (L.) L. [1, 2, 3, 4, 5]; [MG(F), OG(O), PG(C), SG(O)]; [SR/CSR; R/CSR(1), S/CS(1), S/CSR(1), SR/CSR(2)]

Prunella vulgaris L. [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(O), SG(O), MF(R)]; [S/CSR; R/CSR(1), S/CS(1), S/CSR(3), SR/CSR(1)]

Salvia pratensis L. subsp. *pratensis* [1, 2, 3, 4, 5]; [OG(O), SG(F)]; [C/CR; C/CR(1)]

Salvia verbenaca L. [1, 2, 3]; [OG(R), SG(R)]; [CSR; CSR(1)]

Scutellaria columnae All. subsp. *columnae* [1, 2, 4, 5]; [MF(O), XF(O)]; [CSR; CR(1), CSR(3)]

Sideritis purpurea Benth. [1, 2, 3, 4, 5]; [OG(O), SG(C)]; [SR; R(1), R/CSR(1), R/SR(3), S/SR(3), SR(2), SR/CSR(1)]

Stachys tymphaea Hausskn. [1, 2, 3, 4, 5]; [MG(R), OG(F), SG(F)]; [S/CSR; CSR(1), S/CSR(4), SR/CSR(1)]

Teucrium capitatum L. subsp. *capitatum* [1, 2, 3, 4, 5]; [MG(R), SG(C), XF(R)]; [S; S(3), S/SR(2)]

Teucrium chamaedrys L. subsp. *chamaedrys* [1, 2, 3, 5]; [OG(R), SG(O), MF(R), XF(O)]; [S; S(4)]

Thymus longicaulis C. Presl subsp. *longicaulis* [1, 3, 4, 5]; [MG(F), OG(O), PG(C), SG(O), MF(O), XF(R)]; [SR; S/SR(2), SR(2)]

Ziziphora capitata L. subsp. *capitata* [1, 4]; [SG(O)]; [S; S(5)]

Liliaceae

Lilium chalcedonicum L. [1, 3, 4]; [MF(R), XF(O)]; [CR; CR(2), R/CR(1)]

Linaceae

Linum bienne Mill. [1, 3, 4, 5]; [MG(F), OG(O), PG(O), SG(O)]; [SR; R(2), S(4), SR(3)]

Linum corymbulosum Rchb. [1, 2, 3, 4, 5]; [MG(R), SG(C)]; [SR; S/SR(1), SR(1)]

Linum nodiflorum L. [1]; [SG(R)]; [R/CSR; R/CSR(2), R/SR(1), SR(2)]

Linum tenuifolium L. [3]; [SG(R)]; [S; S(4)]

Linum trigynum L. [1, 4, 5]; [MG(O), OG(R)]; [SR; R/SR(2), SR(3)]

Malvaceae

Malva sylvestris L. [2, 3]; [OG(O)]; [CS/CSR; CS(1), CSR(2), S/CS(1)]

Oleaceae

Fraxinus angustifolia subsp. *oxycarpa* (Willd.) Franco & Rocha Afonso [3, 5]; [MG(R), MF(R), RF(C)]; [CS; CS(3), S/CS(1)]

Fraxinus ornus L. [1, 2, 3, 4, 5]; [OG(R), SG(O), MF(O), XF(C)]; [CS; CS(3), CS/CSR(1)]

Ligustrum vulgare L. [1, 3, 4, 5]; [MG(R), MF(O), RF(O)]; [S/CSR; S/CSR(1), S/SR(1)]

Phillyrea latifolia L. [1, 2, 3, 4, 5]; [SG(O), XF(O)]; [S; S(4)]

Orchidaceae

Anacamptis morio subsp. *caucasica* (K. Koch) H. Kretzschmar & al. [1, 5]; [MG(O), OG(R), SG(R)]; [R/CR; R(2), R/CR(5)]

Anacamptis pyramidalis (L.) Rich. [1, 2, 3, 4, 5]; [MG(R), OG(R), SG(O), XF(R)]; [CR; CR(2), R/CR(3)]

Cephalanthera longifolia (L.) Fritsch [1, 3, 5]; [PG(C), MF(O), XF(R)]; [R/CSR; R/CSR(5)]

Cephalanthera rubra (L.) Rich. [1, 2, 3, 5]; [MF(O), XF(O)]; [R/CSR; R/CR(2), R/CSR(1), SR/CSR(1)]

Dactylorhiza saccifera (Brongn.) Soó subsp. *saccifera* [3]; [(ft)]; [C/CR; C/CR(1)]

Himantoglossum jankae Somlyay & al. [1, 5]; [OG(ft), SG(R)]; [R/CR; CR(1), R/CR(1)]

Ophrys mammosa subsp. *parviflora* Kreutz & H. Heitz [3]; [SG(ft)]; [R; R(2), R/CR(1)]

Platanthera chlorantha (Custer) Rchb. subsp. *chlorantha* [3, 4, 5]; [MF(O), XF(R)]; [CR; CR(3)]

Serapias bergonii E. G. Camus [1, 4, 5]; [MG(O), OG(R), SG(R)]; [R/CR; R/CR(8)]

Orobanchaceae

Bellardia latifolia (L.) Cuatrec. subsp. *latifolia* [1, 2, 3, 4, 5]; [MG(O), OG(F), SG(O)]; [R; R(5), R/SR(1)]

Bellardia trixago (L.) All. [4, 5]; [MG(R), OG(R), SG(O)]; [S; S(3), S/SR(1)]

Bellardia viscosa (L.) Fisch. & C. A. Mey. [1, 2, 3, 4, 5]; [MG(O), OG(F), SG(F)]; [SR/CSR; S/CSR(1), S/SR(1), SR(1), SR/CSR(2)]

Plantaginaceae

Plantago afra L. [1, 2, 3, 4]; [SG(F)]; [S/SR; S(1), S/SR(2), SR(3)]

Plantago lanceolata L. [1, 2, 3, 4, 5]; [MG(C), OG(C), SG(F)]; [CSR; CR(1), CS/CSR(1), CSR(1), S/CSR(1)]

Platanaceae

Platanus orientalis L. [5]; [RF(O)]; [C/CSR; C/CSR(3), CS/CSR(1)]

Plumbaginaceae

Armeria rumelica Boiss. [1, 3]; [SG(R)]; [S; S(4), S/SR(1)]

Poaceae

Achnatherum bromoides (L.) P. Beauv. [1, 2, 3, 4, 5]; [OG(O), PG(C), SG(C), MF(O), RF(O), XF(O)]; [S/CS; S(1), S/CS(1)]

Aegilops biuncialis Vis. subsp. *biuncialis* [1, 2, 3, 4, 5]; [MG(R), OG(O), SG(F)]; [S/SR; S(1), SR(2)]

Aegilops comosa subsp. *heldreichii* (Boiss.) Eig [1, 3, 4, 5]; [MG(O), OG(O), SG(O)]; [S/SR; S/SR(1), SR(2)]

Aegilops geniculata Roth [1, 2, 3, 4, 5]; [MG(R), OG(R), SG(O)]; [S/SR; S/SR(1)]

Aegilops neglecta Bertol. subsp. *neglecta* [1, 2, 3, 4, 5]; [MG(O), OG(C), SG(C)]; [S/SR; S/SR(4)]

Aegilops triuncialis L. subsp. *triuncialis* [1, 2, 4, 5]; [MG(O), OG(O), SG(O)]; [S/SR; S/SR(2), SR(1)]

Agrostis castellana Boiss. & Reut. [2, 3]; [MG(O), OG(O), SG(R)]; [S/SR; S/SR(3)]

Agrostis stolonifera L. subsp. *stolonifera* [1, 2, 3, 4, 5]; [MG(F) OG(R), PG(C)]; [S/SR; S/SR(3), SR(1)]

Alopecurus rendlei Eig [1, 2, 3, 5]; [MG(F), OG(O)]; [S/SR; S(2), S/SR(4), SR(3)]

Anthoxanthum odoratum L. [1, 2, 3, 4, 5]; [MG(C), OG(C), SG(F), MF(R), XF(R)]; [SR; R/CSR(1), R/SR(1), S/CSR(2), S/SR(2), SR(1)]

Avena barbata Link subsp. *barbata* [2, 3, 4, 5]; [MG(O), OG(O), SG(C), MF(R)]; [SR; R/SR(1), SR(2), SR/CSR(1)]

Avena sterilis subsp. *ludoviciana* (Durieu) Gillet & Magne [2, 3, 4, 5]; [MG(O), OG(F), SG(O)]; [SR/CSR; CSR(1), S/CSR(1), SR/CSR(2)]

Brachypodium distachyon (L.) P. Beauv. [1, 2, 3, 4, 5]; [OG(R), SG(O)]; [S/SR; S(2), S/SR(3)]

Brachypodium sylvaticum (Huds.) P. Beauv. subsp. *sylvaticum* [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(C), SG(O), MF(C), RF(C), XF(C)]; [S/CSR; S/CSR(2), SR/CSR(2)]

Briza maxima L. [1, 2, 4, 5]; [MG(R), SG(O), XF(R)]; [SR; SR(2)]

Bromus hordeaceus subsp. *mediterraneus* (H. Scholz & F. M. Vázquez) H. Scholz [1, 2, 3, 4, 5]; [MG(O), OG(F), SG(R)]; [R/CSR; R(1), R/CSR(4), R/SR(1), SR(1), SR/CSR(1)]

Bromus racemosus subsp. *lusitanicus* (Sales & P. M. Sm.) H. Scholz & Spalton [1, 2, 3, 5]; [MG(F), OG(O), SG(R)]; [S/SR; S/CSR(1), S/SR(4)]

Bromus ramosus Huds. [3]; [(ft)]; [CR; CR(1)]

Bromus squarrosus L. subsp. *squarrosus* [1, 4]; [OG(R), SG(O)]; [S; S(3), S/SR(2)]

Bromus sterilis L. [1, 2, 3, 4, 5]; [MG(O), OG(C), SG(F)]; [SR; SR(5)]

Catapodium rigidum (L.) C. E. Hubb. [3, 4, 5]; [OG(R), PG(ft), SG(C), RF(ft)]; [SR; R/SR(1), S/SR(3), SR(1)]

Chrysopogon gryllus (L.) Trin. [1, 4, 5]; [MG(O), OG(R), SG(O)]; [SR/CSR; S/CSR(2), SR/CSR(3)]

Cynodon dactylon (L.) Pers. [1, 2, 3, 4, 5]; [MG(O), OG(F), SG(O)]; [S/SR; S/SR(1)]

Cynosurus cristatus L. [1, 3, 4, 5]; [MG(F), OG(O), SG(R), MF(R)]; [SR; R/CSR(1), S/SR(1), SR(3)]

Cynosurus echinatus L. [1, 2, 3, 4, 5]; [MG(F), OG(C), SG(C), MF(O), XF(R)]; [SR/CSR; R/CSR(1), R/SR(1), SR/CSR(3)]

Dactylis glomerata subsp. *hispanica* (Roth) Nyman [1, 2, 4, 5]; [MG(O), OG(C), PG(C), SG(C), MF(F), XF(O)]; [S/SR; S(1), S/SR(4)]

Dasypyrum villosum (L.) P. Candargy [1, 2, 3, 4, 5]; [MG(O), OG(C), SG(C)]; [SR/CSR; SR(3), SR/CSR(2)]

Echinaria capitata (L.) Desf. [1]; [SG(R)]; [S; S(2), S/SR(1)]

Elymus panormitanus (Parl.) Tzvelev [3]; [(ft)]; [S/CSR; S/CSR(4)]

Festuca arundinacea Schreb. s.l. [3, 5]; [MG(O), OG(R)]; [S/CS; S/CS(4), S/SR(3), SR(1)]

Festuca heterophylla Lam. [1, 2, 3, 4, 5]; [PG(O), MF(O), XF(R)]; [S/SR; S/CSR(1), S/SR(1)]

Festuca jeanpertii (St.-Yves) Markgr. s.l. [3, 4]; [SG(O)]; [S; S(4), S/SR(1)]

Gaudinia fragilis (L.) P. Beauv. [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(F)]; [SR; R/CSR(1), R/SR(1), S(1), S/SR(3), SR(7)]

Helictotrichon convolutum (C. Presl) Henrard [1, 2, 3, 4, 5]; [OG(R), SG(O), MF(R), XF(O)]; [S; S(3)]

Holcus lanatus L. subsp. *lanatus* [3, 4, 5]; [MG(R), OG(R), SG(R), RF(ft)]; [SR/CSR; SR/CSR(5)]

Hordeum bulbosum L. [1, 2, 3, 4, 5]; [MG(O), OG(C), SG(O)]; [S/CSR; S/CSR(1), S/SR(1), SR(1), SR/CSR(2)]

Hordeum geniculatum All. [2, 3, 5]; [MG(O), OG(R)]; [S/SR; S/SR(5)]

Hordeum murinum subsp. *glaucum* (Steud.) Tzvelev [2, 3]; [OG(R), MF(ft)]; [SR; R/SR(2), SR(3)]

Koeleria pyramidata (Lam.) P. Beauv. subsp. *pyramidata* [1, 3]; [SG(R), XF(R)]; [S; S(4), S/CS(2), S/SR(3)]

Lolium perenne L. [1, 2, 3, 4, 5]; [MG(F), OG(C), SG(O), MF(R)]; [S/CSR; R/CSR(1), S/CSR(2), S/SR(4), SR/CSR(1)]

Lolium rigidum Gaudin subsp. *rigidum* [1, 3, 5]; [OG(O), SG(R)]; [SR; S/SR(2), SR(3)]

Melica transsilvanica subsp. *klokovii* Tzvelev [1, 4]; [SG(R), XF(R)]; [S/SR; S/SR(4), SR(1)]

Melica uniflora Retz. [1, 2, 4, 5]; [MF(O), RF(O), XF(F)]; [SR/CSR; R/CSR(1), SR/CSR(4)]

Phleum echinatum Host [3, 5]; [OG(R), SG(R)]; [R/SR; R(2), R/CR(1), R/SR(2), SR(1)]

Phleum nodosum L. [1, 2, 3, 4, 5]; [MG(C), OG(O), SG(F), MF(O), XF(R)]; [S/SR; S/CSR(3), S/SR(6), SR/CSR(1)]

Phleum phleoides (L.) H. Karst. [1, 2, 3, 4]; [SG(O)]; [S; S(3), S/SR(1)]

Phleum subulatum (Savi) Asch. & Graebn. [1, 4]; [OG(R), SG(R)]; [S/SR; S/SR(2), SR(2)]

Piptatherum holciforme subsp. *longiglume* (Hausskn.) Freitag [3, 4]; [SG(ft)]; [S/SR; S(2), S/CS(2), S/SR(1)]

Poa compressa L. [3]; [(ft)]; [S/SR; S(1), S/SR(4)]

Poa hybrida Gaudin [3]; [(ft)]; [SR/CSR; SR/CSR(3)]

Poa nemoralis L. subsp. *nemoralis* [1, 2, 3, 4, 5]; [MG(R), PG(O), MF(F), XF(R)]; [SR; SR(3), SR/CSR(1)]

Poa timoleontis Boiss. [1, 2, 3, 4, 5]; [MG(R), OG(F), SG(C), MF(O), XF(O)]; [SR; S(1), S/SR(2), SR(2)]

Poa trivialis subsp. *sylvicola* (Guss.) H. Lindb. [1, 2, 3, 4, 5]; [MG(F), OG(C), PG(C), SG(O), MF(O), RF(C), XF(R)]; [SR; R/SR(1), S/SR(1), SR(1)]

Psilurus incurvus (Gouan) Schinz & Thell. [4, 5]; [SG(O)]; [R; R(3), SR(1)]

Rostraria cristata (L.) Tzvelev [1, 2]; [OG(R), SG(ft)]; [S; S(2), S/SR(1)]

Stipa pulcherrima K. Koch [1, 3, 4]; [SG(O), XF(R)]; [S; S(7), S/CS(2)]

Trisetum flavescens subsp. *splendens* (C. Presl) Arcang. [1, 3, 4]; [MG(O), OG(O), SG(R)]; [SR; S/SR(5), SR(4), SR/CSR(1)]

Vulpia ciliata Dumort. subsp. *ciliata* [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(O)]; [S; S(1)]

Vulpia myuros (L.) C. C. Gmel. [1, 2, 3, 4, 5]; [MG(O), OG(C), SG(O)]; [R/SR; R(1), SR(2)]

Polygalaceae

Polygala monspeliaca L. [1, 3, 4, 5]; [MG(R), SG(O)]; [R/SR; R(1), R/SR(2), S/SR(1), SR(1)]

Polygonaceae

Rumex acetosella subsp. *acetoselloides* (Balansa) Nijs [1, 4, 5]; [MG(R), OG(R)]; [SR/CSR; R(1), R/SR(1), S/CS(1), S/CSR(1)]

Rumex conglomeratus Murray [3]; [(ft)]; [CSR; CS/CSR(1), CSR(1)]

Rumex crispus L. [1, 2, 3, 5]; [MG(O), OG(R), MF(ft)]; [C/CSR; C/CS(1), C/CSR(1), CS(1)]

Rumex obtusifolius subsp. *sylvestris* (Wallr.) Čelak. [3]; [(ft)]; [CR/CSR; C/CSR(1), CR(1)]

Rumex pulcher L. subsp. *pulcher* [1, 2, 3, 4, 5]; [MG(O), OG(C)]; [R/CSR; R/CR(1), R/CSR(2)]

Primulaceae

Anagallis arvensis L. [1, 2, 5]; [OG(R), SG(O)]; [R/SR; R(2), R/SR(1), SR(1)]

Asterolinon linum-stellatum (L.) Duby [1, 2]; [SG(O)]; [SR; SR(1)]

Primula vulgaris Huds. subsp. *vulgaris* [4]; [MF(R), RF(O), XF(O)]; [C/CR; C/CR(4), CR(1)]

Punicaceae

Punica granatum L. [3, 5]; [MF(ft), RF(O)]; [S/CSR; S/CSR(1)]

Ranunculaceae

Clematis flammula L. [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(O), SG(O), MF(F), XF(F)]; [CS/CSR; C/CSR(1), CS(1)]

Clematis vitalba L. [1, 2, 4, 5]; [MG(R), MF(R), RF(C), XF(O)]; [CS/CSR; C/CSR(1), CS/CSR(2), S/CS(1)]

Clematis viticella L. [3]; [(ft)]; [CS/CSR; C/CSR(1), CS(2), CS/CSR(2)]

Consolida ajacis (L.) Schur [1, 2]; [OG(R), SG(O), XF(R)]; [R/CSR; CR(1), R/CSR(3), S/CSR(1), SR/CSR(1)]

Helleborus odorus subsp. *cyclophyllus* (A. Braun) Maire & Petitm. [1]; [PG(C), SG(R), MF(C), XF(C)]; [C/CS; C/CS(4)]

Nigella damascena L. [1, 2, 3, 4]; [MG(R), OG(O), SG(F)]; [S/CSR; S/CSR(2), S/SR(2), SR/CSR(1)]

Ranunculus millefoliatus Vahl [1]; [MG(O), SG(O), MF(R)]; [R/CR; R/CR(2)]

Ranunculus neapolitanus Ten. [1, 2, 3, 4, 5]; [MG(C), OG(F), SG(F), MF(O), RF(C), XF(O)]; [CR/CSR; C/CR(1), C/CSR(1), CR(1), CR/CSR(2), CSR(1)]

Ranunculus psilostachys Griseb. [3]; [OG(R)]; [C/CSR; C/CSR(1), CS/CSR(1)]

Rhamnaceae

Paliurus spina-christi Mill. [2, 5]; [MG(O), OG(O), SG(F), MF(R), XF(O)]; [S/SR; S/CSR(1), S/SR(3), SR(1)]

Rosaceae

Agrimonia eupatoria L. subsp. *eupatoria* [1, 2, 3, 5]; [MG(F), OG(O), PG(C), SG(O), MF(O), XF(R)]; [CS/CSR; C/CSR(1), CS/CSR(4)]

Aremonia agrimonoides (L.) DC. subsp. *agrimonoides* [1, 2, 4, 5]; [OG(R), SG(R), MF(C), XF(C)]; [CSR; CS/CSR(1), CSR(4)]

Crataegus monogyna Jacq. [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(O), SG(O), MF(C), RF(C), XF(C)]; [S/SR; S/CS(3), S/CSR(2)]

Filipendula vulgaris Moench [1, 5]; [SG(R), MF(O), XF(R)]; [S/CSR; S/CSR(1)]

Fragaria vesca L. [1, 4, 5]; [PG(C), MF(O), XF(R)]; [S/CSR; S/CS(1), S/CSR(3)]

Geum urbanum L. [1, 2, 3, 4, 5]; [MG(R), OG(O), PG(C), SG(O), MF(F), RF(C), XF(F)]; [CSR; CR/CSR(1), CS/CSR(1), CSR(2)]

Malus domestica Borkh. [1, 3]; [MF(ft)]; [S/CSR; S/CS(1), S/CSR(1)]

Malus sylvestris (L.) Mill. [1, 3, 4, 5]; [PG(C), MF(O), RF(C), XF(O)]; [S/CSR; S/CSR(1)]

Potentilla micrantha DC. [1, 2, 4, 5]; [SG(R), MF(F), XF(F)]; [CR/CSR; CR/CSR(3), R/CSR(1)]

Potentilla recta subsp. *laciniosa* (Nestl.) Nyman [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(O), SG(F), MF(R)]; [S/CSR; S/CS(1), S/CSR(3), S/SR(1)]

Potentilla reptans L. [1, 2, 3, 5]; [MG(O), OG(O)]; [S/CSR; S/CSR(5)]

Prunus avium (L.) L. [2, 3, 4, 5]; [MF(F), RF(O), XF(O)]; [C/CSR; C/CSR(3)]

Prunus cerasifera Ehrh. s.l. [3, 5]; [OG(R), MF(O)]; [SR/CSR; S/CSR(1), SR/CSR(1)]

Prunus mahaleb L. [1, 2, 3, 5]; [MG(R), OG(R), PG(O), SG(R), MF(O), XF(O)]; [S/CS; S/CS(5)]

Prunus spinosa L. s.l. [1, 2, 3, 4, 5]; [MG(F), OG(O), PG(C), SG(O), MF(C), RF(C), XF(F)]; [S/SR; S(1), S/CS(1), S/CSR(2), S/SR(1)]

Prunus webbii (Spach) Vierh. [1, 4]; [OG(R), SG(O)]; [S; S(2)]

Pyrus spinosa Forssk. [1, 2, 3, 4, 5]; [MG(C), OG(C), PG(O), SG(C), MF(O), XF(R)]; [S/CS; S/CS(4)]

Rosa agrestis Savi [1, 3, 5]; [OG(R), MF(R), XF(R)]; [S/CSR; S/CS(1), S/CSR(3)]

Rosa arvensis Huds. [1, 2, 3, 4, 5]; [MG(R), SG(R), MF(C), XF(F)]; [S/CSR; S/CSR(4)]

Rosa canina L. [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(O), MF(F), RF(C), XF(F)]; [S/CS; S/CS(2), S/CSR(3)]

Rubus canescens DC. [1, 2, 3, 4, 5]; [OG(R), PG(C), SG(R), MF(O), RF(O), XF(O)]; [CS/CSR; CS(1), CS/CSR(3)]

Rubus sanctus Schreb. [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(O), SG(O), MF(O), RF(C), XF(O)]; [CS/CSR; CR/CSR(1), CS/CSR(5)]

Sanguisorba minor subsp. *balearica* (Nyman) Muños Garm. & C. Navarro [2, 3, 4, 5]; [MG(F), OG(C), PG(C), SG(C), MF(R), XF(R)]; [S/CSR; S/CSR(3)]

Sorbus domestica L. [1, 2, 3, 4]; [PG(C), MF(F), XF(O)]; [CS/CSR; CS(1), CS/CSR(3)]

Sorbus torminalis (L.) Crantz [1, 2, 3, 4]; [MF(O), XF(O)]; [CS/CSR; CS(1), CS/CSR(2), S/CSR(1)]

Rubiaceae

Crucianella angustifolia L. [1, 2, 3, 4]; [PG(O), SG(F), MF(R)]; [SR; R(1), S/SR(4)]

Crucianella latifolia L. [2, 3, 4]; [SG(O), XF(R)]; [SR; S/SR(1), SR(1)]
Cruciata laevipes Opiz [1, 2, 3, 4, 5]; [MG(O), OG(O), PG(O), SG(O), MF(R), XF(R)]; [R/SR; R(2), R/SR(2), SR(2)]
Galium aparine L. [1, 4, 5]; [MG(O), OG(O), SG(F), MF(O), RF(O), XF(O)]; [SR; SR(1)]
Galium debile Desv. [3, 5]; [MG(O)]; [R; R(6), R/SR(3), SR(1)]
Galium divaricatum Lam. [1, 4, 5]; [MG(O), OG(R), SG(O)]; [S; S(3)]
Galium intricatum Margot & Reut. [1, 2, 4, 5]; [MG(O), OG(O), SG(C)]; [S; S(5)]
Galium laconicum Boiss. & Heldr. [1, 2, 3, 4, 5]; [MF(O), XF(O)]; [SR; S/SR(2), SR(2)]
Galium verum L. subsp. *verum* [1, 2, 3, 5]; [MG(F), OG(O), SG(R)]; [SR; SR(2)]
Sherardia arvensis L. [1, 2, 3, 4, 5]; [MG(F), OG(C), SG(C)]; [SR; R(2), S(2)]
Theligonum cynocrambe L. [1, 2, 4]; [SG(O), XF(R)]; [R; R(4)]
Ruscaceae
Ruscus aculeatus L. [2]; [SG(O), MF(C), RF(C), XF(C)]; [S; S(3), S/CSR(1)]
Rutaceae
Haplophyllum coronatum Griseb. [2, 3, 4]; [SG(R)]; [S; S(4)]
Scrophulariaceae
Scrophularia canina subsp. *bicolor* (Sm.) Greuter [1, 2, 5]; [SG(R), MF(ft)]; [S/CSR; S/CSR(3), S/SR(1)]
Verbascum banaticum Schrad. [1, 3]; [OG(R), MF(ft)]; [C/CS; C/CS(2), C/CSR(1)]
Verbascum glabratum subsp. *bosnense* (K. Malý) Murb. [1, 3]; [MF(R)]; [C/CR; C/CR(4), C/CS(1)]
Verbascum phoeniceum L. [1]; [MG(O), OG(O), MF(R)]; [C/CR; C(1), C/CR(2)]
Verbascum pulverulentum Vill. [2, 3, 4]; [OG(F), SG(O)]; [C/CS; C(2), C/CR(1), C/CS(2), CS(1)]
Verbascum samniticum Ten. [1]; [MG(R), OG(O), SG(R)]; [C/CS; C/CS(2), CS(1), CS/CSR(1)]
Tiliaceae
Tilia tomentosa Moench [3, 4]; [MF(O), XF(R)]; [CSR; CR/CSR(2), CSR(2)]
Ulmaceae
Celtis australis L. [3, 4, 5]; [MF(ft), RF(O), XF(R)]; [S/CSR; S/CS(1), S/CSR(1), SR/CSR(1)]
Ulmus minor Mill. subsp. *minor* [2, 3, 5]; [MG(O), SG(R), MF(ft), XF(R)]; [S/CSR; CS(1), S/CS(1), S/CSR(2)]
Ulmus procera Salisb. [2, 3, 4, 5]; [OG(O), MF(R), XF(R)]; [R/CSR; R/CSR(1)]
Urtica dioica L. subsp. *dioica* [3, 5]; [RF(C)]; [CR/CSR; C/CSR(1), CR/CSR(2), CSR(1)]
Valerianaceae
Valerianella coronata (L.) DC. [1, 2, 3, 4]; [SG(O)]; [R; R(2), R/CSR(1)]
Valerianella discoidea (L.) Loisel. [2]; [SG(ft)]; [R; R(1)]
Valerianella locusta (L.) Laterr. [3]; [OG(R), SG(ft)]; [R; R(1)]
Valerianella microcarpa Loisel. [1, 2, 4]; [OG(O), SG(O)]; [R; R(4)]
Veronicaceae
Digitalis lanata Ehrh. subsp. *lanata* [1, 3]; [OG(R), SG(R), XF(R)]; [CS/CSR; CS/CSR(2), S/CS(1), S/CSR(1)]
Digitalis viridiflora Lindl. [5]; [MF(ft)]; [CR/CSR; CR(2), CR/CSR(2)]
Kickxia commutata subsp. *graeca* (Bory & Chaub.) R. Fern. [1, 2, 3, 4, 5]; [MG(O), OG(O), SG(O)]; [R/SR; R/SR(2), SR(1), SR/CSR(1)]
Linaria pelisseriana (L.) Mill. [1, 5]; [MG(R), OG(R), SG(R)]; [R; R(4)]
Veronica arvensis L. [1, 2, 3, 4, 5]; [MG(O), OG(C), PG(O), SG(O)]; [SR; R(2), S(1), S/SR(2)]
Veronica chamaedrys subsp. *chamaedryoides* (Bory & Chaub.) M. A. Fisch. [1, 2, 3, 4, 5]; [MG(O), PG(C), SG(O), MF(C), XF(C)]; [SR/CSR; SR(1), SR/CSR(3)]
Veronica persica Poir. [1, 2, 3]; [OG(O)]; [R; R(2)]
Veronica triloba (Opiz) Opiz [3]; [MF(ft)]; [R; R(1)]
Violaceae
Viola odorata L. [1, 2, 3, 4, 5]; [SG(R), MF(O), XF(O)]; [CSR; CR/CSR(1), CSR(3), R/CSR(1)]
Vitaceae
Vitis vinifera subsp. *sylvestris* (C. C. Gmel.) Hegi [2, 5]; [RF(O), XF(R)]; [CR; CR(4)]

Discussion

In the present study, we presented the floristic catalogue of all the vascular plant taxa recorded during a botanical survey aimed at investigating the effects of land use change and land abandonment on plant taxonomic and functional diversity, in the floristic region of Northern Pindus. Despite its small surface area, compared to the other floristic regions of mainland Greece, Northern Pindus hosts a high number of plant taxa and a high number of Balkan endemic woody taxa (Xystrakis & al. 2019; Dimopoulos & al. 2022). During our samplings, we recorded a very small number of taxa that were not mentioned as present in the Northern Pindus floristic region. Therefore, our overall observations support the conclusion that "The Flora of Greece Web" (Dimopoulos & al. 2022) provides very accurate information about species distribution throughout the floristic regions of Greece, and can constitute a great tool for floristic and botanical studies.

In the present study we collected new functional data for 481 taxa occurring in the northwestern submontane region of the Pindus Mountains in Greece. These data were subsequently used for the calculation of the CSR plant strategy for each investigated taxon, by using the "Stratefy" method (Pierce & al. 2017). This method, although based on only three leaf traits, is considered as the best available approach for finding the life strategies of plants occurring across various habitats and geographic regions, since it is developed based on a very large set of plant taxa from multiple biomes (Pierce & al. 2017). This applicability in very distinct ecosystems also explains the general position of our habitat types along the S–R axis. Similarly with our results, Pierce & al. (2017) also found that plant taxa occurring in temperate grasslands as well as Mediterranean forests belonged to all life strategies but their median observed life strategies per biome were allocated along the S–R axis. Although the initial methodology of Hodgson & al. (1999) for the estimation of CSR strategies has incorporated functional traits related with other plant characteristics and organs, such as canopy height, lateral spread and flowering phenology, it has been developed based on a significantly lower number of taxa and from a single biome, limiting its applicability in a variety of habitats.

The calculation of the CSR plant strategies for the investigated taxa led to a database containing the CSR strategies of the 481 taxa occurring in the study area, corresponding to the 75.99 % of the total number of taxa recorded in the study area, during the first year of vegetation sampling. To our knowledge, this is the first attempt for such a systematic collection of plant functional traits in Greece. Particularly, only few studies have previously conducted new measurements of functional trait data for plant material collected from Greece (Chaideftou & al. 2009; Adamidis & al. 2014, 2021; Meletiou-Christou and Rhizopoulou 2016; Michelaki & al. 2019; Fyllas & al. 2020). In total, the above-mentioned studies included primary functional trait data for 63 plant taxa, namely 40 woody and 23 herb taxa (34 of those being also recorded in the present study). These were selected as key species, appropriate for answering specific scientific questions concerning species adaptations to different substrates, habitats or environmental conditions. Therefore, it is becoming apparent that the present study is a significant addition for the available functional trait data from Greece, by providing new functional data for 448 taxa. This number of taxa, with newly collected functional trait data, is not only significantly larger than the previously existing data from Greece, but is also a relatively high percentage of the total flora of Greece. Specifically, our dataset (481 taxa belonging to 479 species) provides measured functional trait data for 7.06 % of the 6811 taxa currently known to occur in Greece, with the percentage being even higher for the species level, corresponding to 8.08 % of the 5927 Greek species (Dimopoulos & al. 2022).

Functional diversity has been recognized as a significant tool for the study of biodiversity, complementary to the traditional taxonomic approach (de Bello & al. 2010; Aubin & al. 2013). It has become apparent that a systematic effort for functional trait data collection should be made, which will allow better understanding of patterns and processes related to community assembly (Cadotte & al. 2011; Mason & al. 2013) and ecosystem functioning (Petchey 2004; Flynn & al. 2011). Toward this direction, apart from the sampling of functional traits conducted within the context of the present study, the vegetation research team of the Laboratory of Systematic Botany and Phytogeography of the Aristotle University of Thessaloniki has made similar sampling efforts of collecting primary functional trait data in other ecosystems as well, such as in coastal habitats and urban areas. Although an undertaking for building a database of functional traits of the Greek flora seems particularly demanding, it should be considered that a small but significant percentage of the taxa occurring in Greece was collected during a single vegetation survey within a limited geographical range. Therefore, an attempt for creating a functional database of the Greek flora could be accomplished by organizing sampling of functional data along different habitats, floristic regions and altitudinal ranges. Nevertheless, the completion of such a national functional trait database would require a greater emphasis given initially on investigating different taxa rather than more individuals of the same taxon. Indeed, the collection of 5 individuals per taxon has allowed us to adequately capture the functional signature of each taxon, at least within our study area and at the same time obtain information about a high number of taxa.

The seven habitats investigated in the present study (meadows, old fields, semi-natural grasslands, pteridophyte stands, mesic forests, xerothermophytic forests and riparian forests) were found to differ in their functional signature. On the one hand, grassland habitats (meadows, old fields, semi-natural grasslands and pteridophyte stands), were observed to have life strategy patterns mostly distributed along the S–R axis of the CSR triangle. On the other hand, forest habitats (mesic forests, xerothermophytic forests and riparian forests) were mostly distributed along the S–C axis of the CSR triangle. The habitats identified within the study area, at least partly, reflect different stages of succession, since they have been affected by the large-scale land use and cover changes that have taken place in the study area during the last decades (Kiziridis & al. 2022). Land use changes have been acknowledged as one the most important factor affecting biodiversity at multiple scales (Gillanders & al. 2008; Haines-Young 2009), by influencing habitat and vegetation composition in most European regions over the recent decades (Poschlod & al. 2005; Stoate & al. 2009). Land abandonment is usually followed by secondary succession, namely passive revegetation of the ex-arable land, which is expected to follow an initial establishment of annual and biannual species, subsequently replaced by perennial forbs, grasses and shrubs, and the final establishment of forest habitats after c. 20 years (Cramer & al. 2008; Zakkak & al. 2018; Prach & al. 2014). Succession is linked to the diversity of CSR life strategies in plant communities, with the initially established ruderal colonizers being replaced by more competitive or more stress-tolerant species, depending on the biotic and abiotic conditions (Caccianiga & al. 2006). The formerly mentioned expected patterns were in agreement with our observations. On the one hand, the earlier stages of succession, represented by grassland communities subjected to higher levels of disturbances, were found to host ruderal species at higher frequencies than the other habitats. On the other hand, habitats of late succession stages, such as the mesic forests, were characterized by higher frequencies of taxa with competitive strategies.

After searching for data availability of life strategies of the 481 taxa for which we calculated tertiary CSR strategies in other sources in the literature, a significant level of data deficiency emerged. Particularly, only three databases of functional trait data were found to include original tertiary CSR strategies for a large number of taxa, with a degree of overlap among them: (1) the Electronic Comparative Plant Ecology (Hodgson & al. 1995); (2) the PLADIAS Database of the Czech flora and vegetation (Chytrý & al. 2021); and (3) the original paper of Pierce & al. (2017). From the 481 taxa for which we calculated tertiary CSR strategies, only 52 % of them were found in these databases, with higher percentages of taxa being found in the PLADIAS Database and the original paper of Pierce & al. (2017), and with some of the PLASIAS records being derived from Pierce & al. (2017), leading to a partial duplication of these two databases. Therefore, our database constitutes a significant contribution to the already available information of tertiary CSR strategies. It is becoming prevalent that, despite the existence of a notable number of functional trait databases, collection of functional trait data from remote and understudied areas at a regional scale remains crucial, since a great variety of ecosystems and local communities remain understudied, but also because ecological niches of species are also known to vary across their distribution areas (Wasof & al. 2013; Hedwall & al. 2019; Mariano & al. 2021).

Apart from the environmental variability, another issue that can lead to observation of intraspecific differences of CSR strategies is the retrieval of trait data from several different functional trait databases, that will subsequently be used for the calculation of a final CSR strategy. Such data, deriving most of the times from various literature sources, are possible to suffer from undesirable data properties, such as differences in sampling and measuring methodology, or mixing of information taken from a great number of populations established across different habitats, possibly spread over varying longitudes and altitudes (Cordlandwehr & al. 2013). These characteristics can be undesirable when joining data for further analyses, due to plastic reactions of traits to differences in environmental conditions and/or genotypic diversity across sites (Mokany & Ash 2008; Whitlock & al. 2010; Scheepens & al. 2010; Pierce & al. 2017). Furthermore, measurement of the plant traits needed for the calculation of life strategy according to the methodology of Pierce & al. (2017) are characterized by a high intraspecific variability (Westerband & al. 2021). According to the latter authors, this variability in leaf dry matter content can become even larger than the respective variability between species. According to Henn & al. (2018), leaf area can be also found to be very plastic between species (e.g. presenting large differentiation in response to environmental changes). However, although the high interspecific variation for individual traits has been investigated and documented so far (see Westerband & al. 2021 and references therein) the intraspecific variation of functional syndromes like life strategy has been rarely assessed (May & al. 2017). The latter authors found a wide spread of life strategy of *Arabidopsis thaliana* individuals across the R–S axis of the triangle of plant life strategies. Although most of the individuals were found to have the SR strategy, three other strategies were also recorded, ranging from S/SC to R/CR. May & al. (2017) attributed that variation among life strategies of *Arabidopsis thaliana* to the different temperature of the localities of the collected individuals, since they originated from three different continents. High intraspecific variability of CSR strategy along the R–S axis was also observed for individuals of *Silene paradoxa* growing on serpentine and non-serpentine substrate (Lazzaro & al. 2021). Baltieri & al. (2020) studied the life strategy differentiation among *Himantoglossum adriaticum* at a local scale (NE Italy) and found a high variation mainly along the C–S axis of the CSR triangle. Specifically, they found four strategies for the species, ranging from C to R/CR, and they attributed this variation mainly to the differentiation of the habitats where the species grew (managed dry grasslands vs abandoned dry grasslands). Moreover, variability of life strategy along the C–R axis was also observed for the steno-endemic *Primula albenensis*, although it grows in only two sites (Giupponi & Giorgi 2019). Within our study, although a great percentage of taxa was found to belong to a single (25.73 % of taxa) or two adjacent strategies (41.91 % of taxa), similar patterns of intraspecific variability were also observed, primarily along the R–S axis and secondarily along the R–C axis. Differentiation along the C–S axis was less frequent in our dataset. Nevertheless, since our study was not focused on investigating intraspecific variability of life strategies, further research is needed in order to be able to make inferences about the drivers of these patterns of variability.

Overall, availability of trait data, and calculations of CSR strategies, at the individual or population level in the form of a regional functional database such the one we present here can be important for various applications. More specifically, it can provide high quality functional trait data, at least partly reflecting species adaptations to regional environmental and habitat variability. Despite its relatively small area, Greece is characterized by particularly high taxonomic and functional plant diversity, and by the occurrence of a great number of rare and endemic taxa, mainly due to its rich topographic and climatic characteristics. Raising the availability of functional trait data for such rare and endemic taxa while also enriching the already available trait data for the more widespread taxa through local scale measurements can be particularly useful for the estimation of the functional diversity in ecosystems occurring in Greece. More specifically, building a database of functional trait information for as many species of the Greek flora as possible, would constitute a great tool for ecological research as well as biodiversity monitoring and conservation planning. As an initial step toward this aim, the final CSR functional database created by the present study is available online as Supporting Information and provides the centroid and individual CSR strategies calculated for 481 taxa of the Greek flora.

Author contributions

IT coordinated the study; IT and AM taxonomically identified the specimens; AM, AE and MP conducted functional trait measurement and data preparation; AM prepared the first draft of the manuscript. All authors contributed to the conceptualization of the study, the field survey, as well as the final revision and editing of the manuscript.

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Supplement 1.
Fig. S1. The distribution of the 629 studied taxa in chorological types.
Fig. S2. The distribution of the 629 studied taxa in life forms.
Table S1. Distribution of taxa along the 19 tertiary CSR life strategies of Grime, and general groups of strategies.

Supplement 2. CSR values of investigated taxa.

Supplement 3. Floristic catalogue.

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