

Flora of the important landscape "Zelinska glava" (Eastern Medvednica Mt., Central Croatia)

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Abstract

The area of "Zelinska glava", under the protection of the Public Institution "Green Ring of Zagreb County (Zeleni prsten Zagrebačke županije)", covers an area of 9.5 km². Research into the area's vascular flora was conducted during the growing seasons of 2019 and 2020. A total of 330 taxa of vascular flora were recorded, classified within 82 plant families. Fourteen species of bryophytes were added to the list of vascular flora. The most common families are Compositae (13%), Fabaceae (7%), Rosaceae (7%) and Lamiaceae (6%). The analysis according to habitats shows that the most species inhabit forest edges along paths (51%), followed by meadows (18%). Phytogeographic analysis shows that the Eurasian floristic element dominates (45%), followed by cultivated and adventive plants (10%). Regarding life forms, the largest number of taxa belong to hemicryptophytes (51%). According to the Red Book of Croatian Vascular Flora, 12 taxa belong to one of the threat categories. Eight taxa are strictly protected by law, seven of them belonging to the Orchidaceae family. A total of eight invasive species were recorded in the study area.

Keywords: CRS strategies, geoelements, habitat preferences, life forms, phytogeography

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Sažetak

Područje Zelinske glave, pod zaštitom je Javne ustanove Zeleni prsten Zagrebačke županije i zauzima površinu od 9,5 km². Vaskularna flora ovog područja je istraživana tijekom vegetacijskih sezona 2019. i 2020. godine. Ukupno je zabilježeno 330 svojti vaskularne flore raspoređenih u 82 biljne porodice. Popisu vaskularne flore pridodano je i 14 vrsta mahovina. Najzastupljenije porodice su Compositae (13 %), Fabaceae (7 %), Rosaceae (7 %) i Lamiaceae (6 %). Analiza prema staništima pokazuje da najveći

broj svojiti nastanjuje šumske rubove uz putove (51 %), a sljedeće su livade koje nastanjuje 18 % svojiti. Fitogeografska analiza ukazuje na najveću zastupljenost euroazijskog flornog elementa s 45 %, za kojim slijede kultivirane i adventivne biljke s 10 %. S obzirom na životne oblike najveći broj svojiti pripada hemikriptofitima (51 %). Prema Crvenoj knjizi vaskularne flore Hrvatske, 12 svojiti svrstano je u neku od kategorija ugroženosti, a zakonom je strogo zaštićeno osam svojiti, od kojih sedam pripada porodici Orchidaceae. Na istraživanom području zabilježeno je ukupno osam invazivnih vrsta.

Ključne riječi: CRS strategije, fitogeografija, geoelementi, stanišne preferencije, životni oblici

Introduction

The area of "Zelinska glava" is an eastern outcrop of Medvednica Mt. and was proclaimed a nature reserve in 1992. It stretches northwest from the town of Sveti Ivan Zelina and covers an area of 9.5 km² (Fig. 1). The peaks of "Zelinska glava" reach 574 m a. s. l., and the landscape alternates between mountain meadows and forests. According to Köppen's climate classification, the studied area

has a moist mid-latitude climate (C), with a mean yearly precipitation of 1,262 mm, the maximum occurring between September and December. The Medvednica Mt. (120 – 1,035 m a. s. l.) belongs to the Illyrian province of the Eurosiberian-North American forest region. Phytogeographically, it is divided into two vegetation belts: the lower forest belt belongs to the alliance *Carpinion betuli* Isler 1932, and the higher forest belt to the alliance *Aremonio-Fagion* (Horvat 1950) Borhidi in Török et al. 1989. The predominant association within the former belt is *Epimedio-Carpinetum betuli* (Horvat 1938) Borhidi 1963, while some azonal acidophilous forests are also developed, such as *Quercu-Castanetum sativae* Horvat 1938 and *Potentillo micranthae-Quercetum petraeae* (Vukelić 1991) Vukelić, Baričević et Šapić 2010 (cf. Dobrović et al. 2006). Given its proximity to the capital of Croatia, this broader area has been researched in detail for more than 150 years, and more than 1,300 plant taxa have been recorded on Medvednica Mt. (Dobrović et al. 2006).

Floristic research has not been carried out in this area before. The main goal of this research was to compile the checklist of the vascular flora of the important landscape "Zelinska glava". Other goals were to investigate the diversity of the bryophytes and to carry out an analysis of the flora regarding life forms, the CRS strategies, and geoelements and preferences for habitat types. Non-native, endangered and protected taxa are also listed.



Figure 1. Geographical position of the studied area of "Zelinska glava".

Materials and methods

Field research was conducted during two growing seasons, from March to October 2019 and 2020. Standard determination keys and iconographies were used to identify plant taxa: Horvatić (1954), Jávorka & Csapody (1991), Domac (1994), Alegro (2003), Alegro et al. (2003), Blamey & Grey-Wilson (2004), Delforge (2006) and Nikolić (2019). The nomenclature of plant taxa follows The Flora Croatica Database (Nikolić 2005-onwards). Threat categories were taken from the Red Book of the Vascular Flora of Croatia (Nikolić et Topić 2005), and updated according to the Online Red Book (Nikolić 2005-onwards). Legal protection status was taken from the Ordinance on Strictly Protected Species (Anonymous 2013, 2016). Plant taxa are arranged in an alphabetical list of families, genera and species (Appendix 1). Moss taxa are arranged in an alphabetical list of families, genera and species (Appendix 2).

Each species is associated with the type of habitat(s) where it was recorded. The following habitat categories were used: forest, meadow, forest edges, thickets, wet habitats, rocks and walls, orchards and tree plantations.

Furthermore, to each taxon was assigned a geoelement (floral element) according to Horvatić (1963) and Horvatić et al. (1967 – 1968) updated and supplemented according to recent authors (Simon et al. 1992, Aeschmann et al. 2004, Landolt et al. 2010), with the following numerical codes: 1 – Mediterranean, 2 – Illyrian-Balkan, 3 – South-European, 4 – Atlantic, 5 – East-European-Pontic, 6 – Southeast-European, 7 – Central-European, 8 – European, 9 – Eurasian, 10 – circum-holarctic, 11 – widespread plants, 12 – cultivated and adventitious plants. For bryophyte species the categories of biogeographic elements according to Hill et al. (2007), in respect to major biomes (E1) and eastern limit (E2), were assigned.

Life forms were analysed using following categories: P – phanerophytes, N – nanophanerophytes, Ch – chamaephytes, H – hemicryptophytes, T – therophytes, G – geophytes (Ellenberg et al. 2010, Oberdorfer 2001).

Life strategies were analysed using the CSR system (Grime 1979) with following categories: C – competitive plants, S – stress-tolerant plants and R – ruderal plants.

Results and discussion

A total of 330 taxa of vascular plants classified into 82 plant families were recorded. The majority of the species belongs to the following families: Compositae (13%), Fabaceae (7%), Rosaceae (7%), Lamiaceae (6%), Poaceae (5%), Scrophulariaceae (4%), Ranunculaceae (3%) and Brassicaceae (3%) (Fig. 2), which are also the families most represented in the entire Croatian flora (Dobrović et al. 2006), but not in the same order. Seven species have been recorded within the Orchidaceae family, which have a high conservation value.

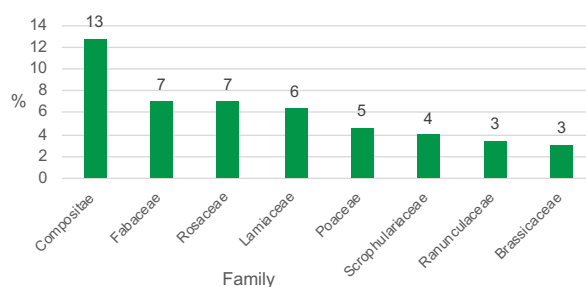


Figure 2. The commonest plant families in the flora of "Zelinska glava".

Regarding habitat types the richest are the forest edges with 51% of recorded taxa. Forest edges are of the transitional habitat type with significant but extensive human influence, making them suitable for different species. All orchid species, all species from the families Cyperaceae, Euphorbiaceae, the majority of species from the family Compositae and the single species from the family Asclepiadaceae (*Vincetoxicum hirundinaria*) were recorded there. Forest edges were followed in importance by meadows with 18% and thickets with 10% of the total species numbers. Meadows do not occupy a large area, but are very rich in species. Some species grow only in these habitats: *Lychnis*

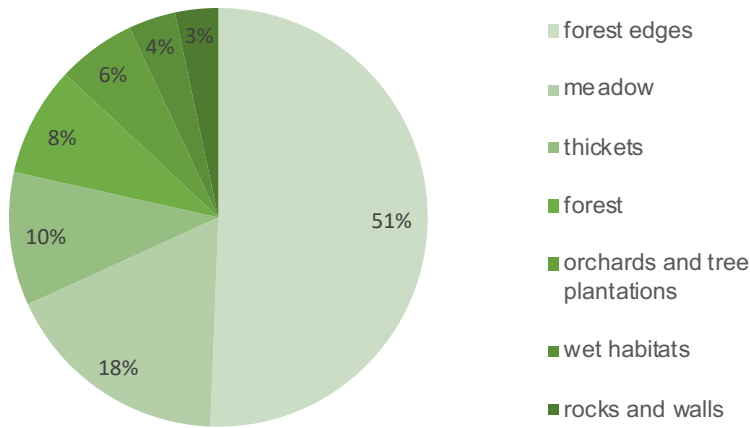


Figure 3. Species number across habitat types in the area of "Zelinska Glava".

flos-cuculi, *Hypericum perforatum*, *Centaurea jacea*, *Coronilla varia*, *Betonica officinalis*, *Papaver rhoeas* and *Colchicum autumnale*. Forests are the most extensive habitats in the research area, but only 8% of species were recorded here. The lowest number of taxa (3%) were recorded on rocks and walls due to the more extreme conditions regarding water and soil amount and isolation. The species growing here are primarily ferns from the family Aspleniaceae, *Chelidonium majus*, *Fragaria vesca* and *Arenaria serpyllifolia* (Fig. 3).

The high number of plant species is a result of various factors. The Medvednica Mt. (together with the Samoborsko gorje Heights), represents a phytogeographic link between the Alps and the Dinarides encompassing plant species from two biogeographical regions (Dobrović et al. 2006). Furthermore, the moderate climate and the high variety of habitat types because of the extensive anthropogenic influence have a significant impact on the richness of the flora. Dobrović et al. (2006) demonstrated that the eastern and southwestern parts of Medvednica are floristically richer than other parts, due to the higher diversity of habitats and their mosaic arrangement in that area.

■ forest edges
 ■ meadow
 ■ thicket
 ■ forest
 ■ orchards and tree plantations
 ■ wet habitats
 ■ rocks and walls

The phytogeographical analysis shows that the investigated area is dominated by plants of the Eurasian geoelement (45%), which was to be expected due to the geographical position of Medvednica Mt. in the Eurosiberian floristic region. The second largest group are adventitious and cultivated plants with

10% due to large surfaces under orchards and tree plantations. The European geoelement is represented with 9% and the Central European and South European geoelements with 8%, each. Such relationships of the European, Central European and South European geoelements reflect the phytogeographical position of the researched area located in the south of the Central European floristic province with the influence of the southern, thermophilous, sub-Mediterranean zone. The presence of the Mediterranean element (5%) in this area is mostly conditioned by human activities, and these species can be considered archaeophytes (Fig. 4).

Life forms reflect the adaptation of plants to ecological conditions, and their presence indicates the climatic characteristics of the area (Horvat 1949). The researched area is in the zone of the moist mid-latitude climate (C) (Hruševar 2009) and the most recorded taxa are hemicryptophytes (51%). Second place is shared by phanerophytes and geophytes (16%), which dominate in deciduous forests. Therophytes (11%), here predominantly indicators of the anthropogenic influence, belong to southern geoelements (Fig. 5).

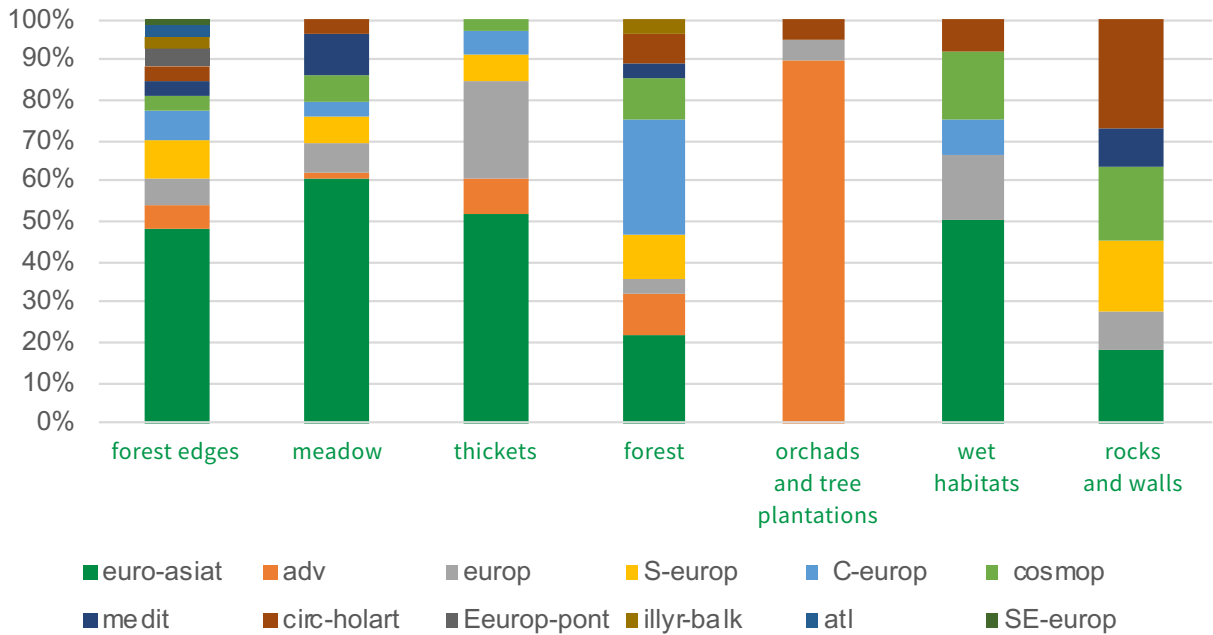


Figure 4. Spectrum of geoelements across habitat types in the area of "Zelinska Glava" (euro-asiat – Eurasian, adv – cultivated and adventitious plants, europ – European, S-europ – South-European, C-europ – Central-European, cosmop – widespread plants, med – Mediterranean, circ-holoart – circum-holarctic, Eeurop-pont – East-European-Pontic, illyr-balk – Illyrian-Balkan, atl – Atlantic, SE-europ – Southeast-European).

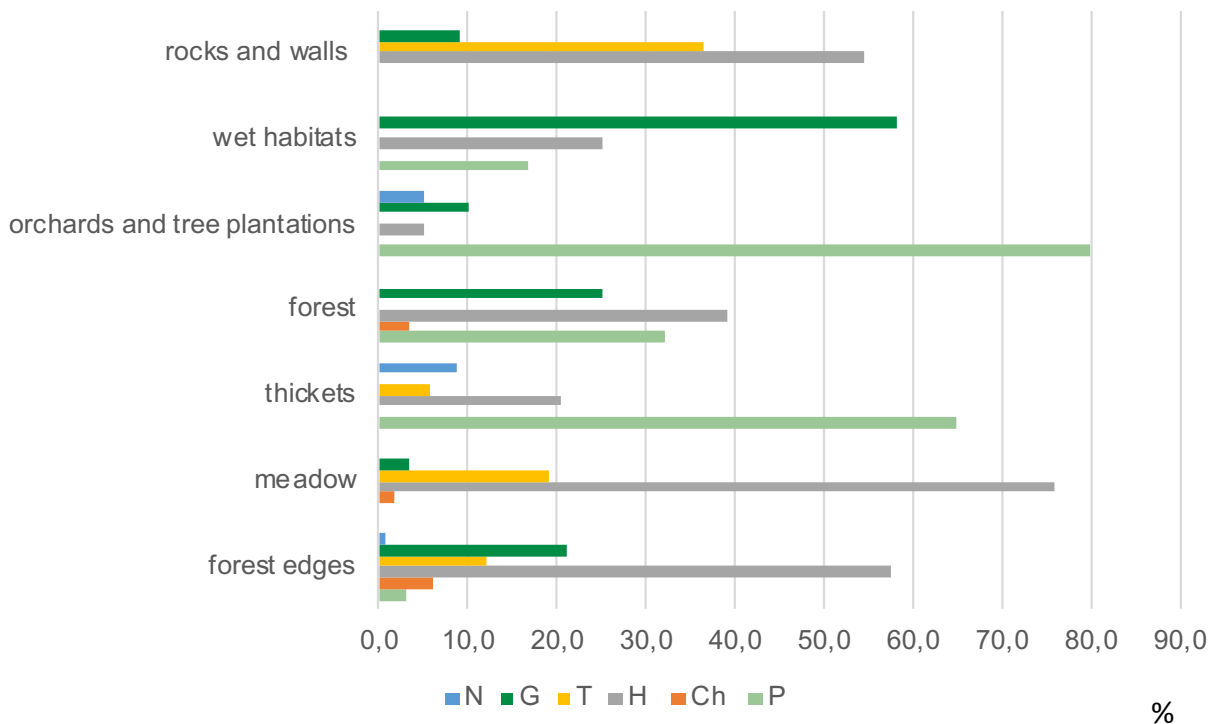


Figure 5. Spectrum of life forms across habitat types in the area of "Zelinska Glava" (N – nanophanerophytes, G – geophytes, T – therophytes, H – hemicryptophytes, Ch – chamaephytes and P – phanerophytes).

All together 12 species from the Red List were recorded, of which three species are vulnerable (*Ilex aquifolium*, *Neottia nidus-avis* and *Orchis purpurea*), six are near threatened (*Anagallis arvensis*, *Cephalanthera damasonium*, *Daphne laureola*, *Epilobium montanum*, *Ruscus hypoglossum* and *Staphylea pinnata*) and one species has the category of least concern (*Ruscus aculeatus*). The recorded taxa mostly inhabit forests and forest edges, and therefore those habitats have high conservation value.

Tertiary relics *Lamium orvala* and *Vicia oroboides* are widely distributed in the entire area of Medvednica, which shows that it was an important refuge during the last ice age where different species found shelter (Dobrović et al. 2006).

Eight invasive species were recorded (*Ambrosia artemisiifolia*, *Artemisia verlotiorum*, *Conyza canadensis*, *Erigeron annuus*, *Galinsoga parviflora*, *Robinia pseudoacacia*, *Solidago gigantea* and *Veronica persica*) (according to Nikolić et al. 2014). These species are mostly weeds and ruderal species, except *Robinia pseudoacacia*, which is the only woody invasive species in the area growing along the forest edges, and in some places forming dense forest stands. Although some invasive species form very dense populations (*Erigeron annuus* and *Solidago gigantea*), not a single habitat is threatened by the size of these populations, as their numbers are still under control.

Through the analysis of CSR strategies, it was observed that orchards and tree plantations have the highest number of competitive species (93%), followed by thickets (78%) and forests (59%). Some of the cultivated species with dominant C-strategy are *Thuja occidentalis*, *Picea abies*, *Picea pungens* and *Pinus nigra*. The competitive strategy is precisely the strategy of woody species, which are long-living, tall and often with a lower need for light enabling them to compete strongly with other plants. Interestingly, in thickets the share of competitive species is 20% higher than in forests. Although both habitats are dominated by woody species, this difference can be explained by the fact that in forests there is a well-developed layer of ground herbaceous plants belonging to other

strategic groups, while in thickets this layer is much poorer due to the dense assemblage of the bush canopy that strongly shades the ground and at the same time suppresses herbaceous species spatially. Rocks and walls are open habitats with a lower density of plants, so competitive relations are also weak, which enables the settlement of species with a ruderal strategy. Ruderal strategy refers to pioneer species, i.e. mostly short-living, low, non-woody species with high seed production and high light requirements. Some of the species with dominant R-strategy are *Senecio vulgaris*, *Euphorbia helioscopia*, *Cerastium brachypetalum* and *Capsella bursa-pastoris*. These species are specialists, adapted to special conditions that do not suit most species, so they are particularly successful in ecologically extreme habitats where competition from other species is weak. According to the stress tolerant strategy, habitats are quite uniform. Here again, orchards and tree plantations with a lower proportion of S-strategy species (7%), stand out, also due to the strong anthropogenic conditioning of these habitats. For the reasons already described, the share of this strategy is relatively small in thickets (12%). In other habitat types, its share ranges roughly between 25 and 35% (Tab. 1).

Table 1. CSR strategies across the habitat types in the area of "Zelinska Glava" (C – competitive, S – stress-tolerant and R – ruderal plants).

Habitat	C (%)	R (%)	S (%)
forest edges	46	27	27
meadow	35	40	25
thickets	78	10	12
forest	59	5	36
orchards and tree plantations	93	0	7
wet habitats	50	17	33
rocks and walls	20	47	33

All together 14 species of bryophytes (*Bryophyta*), belonging to 11 families, were added to the list of vascular flora.

Literature

- Aeschimann, D., Lauber, K., Moser, D. M., Theurillat, J.-P. (2004): *Flora alpina* 1-3. Haupt Verlag, Bern-Stuttgart-Wien.
- Alegro, A. (2003): *Bromus*. In: Nikolić, T. (ed.): Ključevi za određivanje svojiti kritičnih skupina. Botanički zavod PMF-a. Interna verzija br. 01.
- Alegro, A., Bogdanović, S., Topić, J. (2003): *Carex* L. U: Nikolić, T. (ur.): Ključevi za određivanje svojiti kritičnih skupina. Botanički zavod PMF-a. Interna verzija br. 01.
- Anonymous (2013): Pravilnik o strogo zaštićenim vrstama. Official Gazette „Narodne novine“ 144/13.
- Anonymous (2016): Pravilnik o strogo zaštićenim vrstama. Official Gazette „Narodne novine“ 73/16.
- Blamey, M., Grey-Wilson, C. (2004): *Wild flowers of the Mediterranean*. A & C Black, London.
- Delforge, P. (2006): *Orchids of Europe, North Africa and the Middle East*. Timber Press, Portland, Oregon.
- Dobrović, I., Nikolić, T., Jelaska, S. D., Plazibat, M., Hršak, V., Šošarić, R. (2006): An evaluation of floristic diversity in Medvednica Nature Park (northwestern Croatia). *Plant Biosystems* 140(3): 234-244.
- Domac, R. (1994): *Flora Hrvatske – priručnik za određivanje bilja*, Školska knjiga, Zagreb.
- Eggenberg, S., Möhl, A. (2013): *Flora vegetativa*. Haupt Verlag, Bern.
- Ellenberg, H., Leuschner, C. (2010): *Vegetation Mitteleuropas mit den Alpen*. 6. Auflage. Verlag Eugen Ulmer, Stuttgart.
- Grime, J. P. (1979): *Plant strategies and vegetation processes*. John Wiley and Sons, New York
- Hess, H. E., Landolt, E., Hirzel, R., Baltisberger, M. (2010): *Bestimmungsschlüssel zur Flora der Schweiz und angrenzender Gebiete*. Sechste, aktualisierte und überarbeitete Auflage. Springer Verlag, Basel.
- Hill, M. O., Preston, C. D., Bosanquet, S. D. S., Roy, D. B. (2007): *BRYOATT – Attributes of British and Irish Mosses, Liverworts and Hornworts*. NERC Centre for Ecology and Hydrology & Countryside of Wales, Monks Wood, Abbots Ripton, Huntingdon, Cambridgeshire.
- Hodgson, J. G., Wilson, P. J., Hunt, R., Grime, J. P., Thompson, K. (1999): Allocating CSR-plant function types: a soft approach to a hard problem. *OIKOS* 85: 282-294.
- Horvat, I. (1949): *Nauka o biljnim zajednicama*, Nakladni zavod Hrvatske, Zagreb.
- Horvatić, S. (1954): *Ilustrirani bilinar. Priručnik za određivanje porodica i rodova višega bilja*. Školska knjiga, Zagreb.
- Horvatić, S. (1963): *Vegetacijska karta otoka Paga s općim pregledom vegetacijskih jedinica Hrvatskog primorja*. Zagreb. Prirodoslovna Istraživanja Jugoslavenske Akademije 33. *Acta Biologica* 4.
- Horvatić, S., Ilijanić, Lj., Marković-Gospodarić, Lj. (1967-1968): *Biljni pokrov okolice Senja*. *Senjski zbornik* 3: 298-322.
- Hruševar, D. (2009): *Flora istočne Medvednice*. Diplomski rad, Sveučilište u Zagrebu, Prirodoslovno-matematički fakultet, Biološki odsjek, Zagreb.
- Jávorka, S., Csapody, V. (1991): *Iconographia florum partis austro-orientalis Europae centralis*. Akademiai Kiado, Budapest.
- Landolt, E., Bäumler, B., Erhardt, A., Hegg, O., Klötzli, F., Lämmli, W., Nobis, M., Rudmann-Maurer, K., Schweingruber, F. H., Theurillat, J., Urmi, E., Vust, M., Wohlgemuth, T. (2010): *Flora indicativa - Ökologische Zeigerwerte und biologische Kennzeichen zur Flora der Schweiz und der Alpen*. Haupt Verlag, Bern.
- Martinčić, A., Wraber, T., Jogan, N., Podobnik, A., Turk, B., Vreš, B. (2007): *Mala flora Slovenije*. Tehniška založba Slovenije, Ljubljana.

- Mihelić, P., Alegro, A. (2018): Fitogeografske značajke naselja Bregane. *Acta Geographica Croatica* 43/44(1): 21-36.
- Nikolić, T., Topić, J. (eds) (2005): Crvena knjiga vaskularne flore Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode, Zagreb
- Nikolić, T. (ed.) (2005-onwards): Red Book On-Line. Flora Croatica Database. University of Zagreb, Faculty of Science, Department of Botany, Zagreb. <http://hirc.botanic.hr/fcd> (accessed January 2023).
- Nikolić, T., Mitić, B., Boršić, I. (2014): Flora Hrvatske: invazivne biljke. Alfa d.d., Zagreb.
- Nikolić, T. (2019): Flora Croatica 4 – Vaskularna flora Republike Hrvatske. Alfa d.d., Zagreb.
- Nikolić, T. (ed.) (2005-onwards): Flora Croatica Database. University of Zagreb, Faculty of Science, Department of Botany, Zagreb. <http://hirc.botanic.hr/fcd> (accessed January 2023).
- Oberdorfer, E. (2010): Pflanzensozio-logische Exkursionsflora. Verlag Eugen Ulmer, Stuttgart.
- Parolly, G., Rohwer, J. G. (2019): Schmeil-Fitschen Die Flora Deutschlands und angrenzender Länder. Quelle & Meyer, wiebelsheim.
- Pignatti, S. (2018): Flora d'Italia 1-3. Edagricole, Bologna.
- Raunkiaer, C. (1934): The life forms of plants and statistical plant geography. Clarendon Press, Oxford.
- Rothmaler W. (2011): Exkursionsflora von Deutschland. Spektrum Akadaemischer Verlag, Heilderberg.
- Simon, T., Horánszky, A., Dobloyi, K., Szerdahelyi, T., Horváth, F. (1992): A magyar edényes flóra értékelő táblázata, in: Simon, T., Magyarországi, A.: A magyarországi edényes flóra határozója: 837-955. Nemzeti Tankönyvkiadó, Budapest.

Appendix 1. The list of vascular plant taxa recorded in the area of "Zelinska glava" (Abbreviation: **IUCN category:** DD – Data Deficient, LC – Least Concern, NT – Near Threatened, VU – Vulnerable; **Chorotype:** 1 – Mediterranean, 2 – Illyrian-Balkan, 3 – South-European, 4 – Atlantic, 5 – East-European-Pontic, 6 – Southeast-European, 7 – Central-European, 8 – European, 9 – Eurasian, 10 – circum-holarctic, 11 – widespread plants, 12 – cultivated and adventitious plants; **Life form:** N – nanophanerophytes, G – geophytes, T – therophytes, H – hemicryptophytes, Ch – chamaephytes, P – phanerophytes; **CSR strategies:** c – competitive, s – stress-tolerant, r – ruderal.

Family	Taxon	IUCN category	Invasive	Chorotype	Life-form	Habitat	C-strategy	R-strategy	S-strategy
Aceraceae	<i>Acer campestre</i> L.			9	P	thickets	3	0	0
Aceraceae	<i>Acer platanoides</i> L.			7	P	thickets	3	0	0
Aceraceae	<i>Acer pseudoplatanus</i> L.			8	P	forest	3	0	0
Alismataceae	<i>Alisma plantago-aquatica</i> L.			11	G	wet habitats	1	1	1
Amaryllidaceae	<i>Allium ursinum</i> L.			9	G	wet habitats	1	1	1
Anacardiaceae	<i>Hedera helix</i> L.			7	P	forest	2	0	1
Apiaceae	<i>Daucus carota</i> L.			1	H	meadow	0	1	2
Apiaceae	<i>Heracleum sphondylium</i> L.			9	H	forest edges	1	1	1
Apiaceae	<i>Sanicula europaea</i> L.			9	H	forest	1	1	1
Apiaceae	<i>Angelica sylvestris</i> L.			9	H	thickets	2	0	1
Apiaceae	<i>Anthriscus sylvestris</i> (L.) Hoffm.			9	H	thickets	2	0	1
Apiaceae	<i>Hacquetia epipactis</i> (Scop.) DC.			2	H	forest	2	0	1
Apiaceae	<i>Aegopodium podagraria</i> L.			9	H	thickets	3	0	0
Aquifoliaceae	<i>Ilex aquifolium</i> L.	VU		12	P	orchards and tree plantations	3	0	0
Araceae	<i>Arum maculatum</i> L.			8	G	wet habitats	1	1	1
Aristolochiaceae	<i>Asarum europaeum</i> L.			9	H	forest	2	0	1
Asclepiadaceae	<i>Vincetoxicum hirundinaria</i> Medik.			9	G	forest edges	2	0	1
Asparagaceae	<i>Polygonatum multiflorum</i> (L.) All.			10	G	forest edges	1	1	1
Asparagaceae	<i>Convallaria majalis</i> L.			10	G	orchards and tree plantations	2	0	1
Asparagaceae	<i>Ruscus aculeatus</i> L.	LC		12	G	orchards and tree plantations	3	0	0

Family	Taxon	IUCN category	Invasive	Chorotype	Life-form	Habitat	C-strategy	R-strategy	S-strategy
Asparagaceae	<i>Ruscus hypoglossum</i> L.	NT		1	G	forest	3	0	0
Aspleniaceae	<i>Asplenium ruta-muraria</i> L.			10	H	rocks and walls	0	1	2
Aspleniaceae	<i>Asplenium trichomanes</i> L.			11	H	rocks and walls	0	1	2
Aspleniaceae	<i>Asplenium scolopendrium</i> L.			10	H	rocks and walls			
Balsaminaceae	<i>Impatiens noli-tangere</i> L.			9	T	forest edges	2	0	1
Betulaceae	<i>Betula pendula</i> Roth			9	P	forest edges	2	0	1
Boraginaceae	<i>Myosotis sylvatica</i> Hoffm.			9	H	forest edges	1	1	1
Boraginaceae	<i>Omphalodes verna</i> Moench			2	H	forest edges	2	0	1
Boraginaceae	<i>Pulmonaria officinalis</i> L.			6	H	forest edges	2	0	1
Boraginaceae	<i>Symphytum tuberosum</i> L.			3	G	forest edges	2	0	1
Boraginaceae	<i>Lithospermum purpureoeruleum</i> L.			5	H	forest edges			
Brassicaceae	<i>Capsella bursa-pastoris</i> (L.) Medik.			11	H	forest edges	0	3	0
Brassicaceae	<i>Barbarea vulgaris</i> R.Br.			9	H	forest edges	1	2	0
Brassicaceae	<i>Cardamine bulbifera</i> (L.) Crantz			7	G	forest edges	1	1	1
Brassicaceae	<i>Cardamine enneaphyllos</i> (L.) Crantz			9	G	forest edges	1	0	2
Brassicaceae	<i>Cardamine hirsuta</i> L.			4	T	forest edges	1	1	1
Brassicaceae	<i>Cardamine impatiens</i> L.			9	H	forest edges	1	1	1
Brassicaceae	<i>Cardaminopsis arenosa</i> (L.) Hayek			8	T	rocks and walls	1	1	1
Brassicaceae	<i>Rorippa sylvestris</i> (L.) Besser			7	H	forest edges	1	1	1
Brassicaceae	<i>Alliaria petiolata</i> (M. Bieb.) Cavara et Grande			9	H	forest edges	2	1	0
Brassicaceae	<i>Lunaria rediviva</i> L.			8	H	forest edges	2	0	1
Campanulaceae	<i>Campanula patula</i> L.			8	H	meadow	1	1	1
Campanulaceae	<i>Campanula trachelium</i> L.			9	H	forest edges	2	0	1
Cannabaceae	<i>Humulus lupulus</i> L.			9	H	thickets	2	0	1
Caprifoliaceae	<i>Sambucus ebulus</i> L.			8	H	thickets	3	0	0
Caprifoliaceae	<i>Sambucus nigra</i> L.			8	P	thickets	3	0	0
Caprifoliaceae	<i>Symphoricarpos albus</i> (L.) S. F. Blake			12	N	orchards and tree plantations	3	0	0
Caprifoliaceae	<i>Viburnum lantana</i> L.			9	N	thickets	3	0	0

Family	Taxon	IUCN category	Invasive	Chorotype	Life-form	Habitat	C-strategy	R-strategy	S-strategy
Caryophyllaceae	<i>Arenaria serpyllifolia</i> L.			11	T	rocks and walls	0	2	1
Caryophyllaceae	<i>Cerastium brachypetalum</i> Desp.			3	T	rocks and walls	0	3	0
Caryophyllaceae	<i>Cerastium glomeratum</i> Thuill.			1	T	rocks and walls	0	3	0
Caryophyllaceae	<i>Silene dioica</i> (L.) Clairv.			8	H	forest edges	1	1	1
Caryophyllaceae	<i>Stellaria holostea</i> L.			9	Ch	forest edges	1	1	1
Caryophyllaceae	<i>Stellaria media</i> (L.) Vill.			1	T	forest edges	1	2	0
Caryophyllaceae	<i>Silene nutans</i> L.			9	H	forest edges	2	0	1
Caryophyllaceae	<i>Lychnis flos-cuculi</i> L.			9	H	meadow			
Celastraceae	<i>Euonymus europaeus</i> L.			9	P	thickets	3	0	0
Chenopodiaceae	<i>Chenopodium album</i> L.			9	T	forest edges	0	3	0
Clusiaceae	<i>Hypericum perforatum</i> L.			9	H	meadow	1	1	1
Clusiaceae	<i>Hypericum hirsutum</i> L.			9	H	forest edges	2	1	0
Colchicaceae	<i>Colchicum autumnale</i> L.			7	G	meadow	1	1	1
Compositae	<i>Crepis capillaris</i> (L.) Wallr.			9	T	forest edges	0	2	1
Compositae	<i>Senecio vulgaris</i> L.			1	T	forest edges	0	3	0
Compositae	<i>Ambrosia artemisiifolia</i> L.		+	12	T	forest edges	1	2	0
Compositae	<i>Artemisia absinthium</i> L.			12	Ch	forest edges	1	1	1
Compositae	<i>Artemisia vulgaris</i> L.			11	H	forest edges	1	1	1
Compositae	<i>Bellis perennis</i> L.			9	H	meadow	1	1	1
Compositae	<i>Bidens frondosa</i> L.			12	T	forest edges	1	2	0
Compositae	<i>Centaurea jacea</i> L.			9	H	meadow	1	1	1
Compositae	<i>Cichorium intybus</i> L.			9	H	forest edges	1	1	1
Compositae	<i>Cirsium vulgare</i> (Savi) Ten.			9	H	forest edges	1	2	0
Compositae	<i>Conyza canadensis</i> (L.) Cronquist		+	12	T	forest edges	1	2	0
Compositae	<i>Crepis vesicaria</i> L. ssp. <i>taraxacifolia</i> (Thuill.) Thell.			4	H	forest edges	1	2	0
Compositae	<i>Galinsoga parviflora</i> Cav.		+	12	T	forest edges	1	2	0
Compositae	<i>Hieracium murorum</i> L.			9	H	forest edges	1	1	1
Compositae	<i>Inula conyza</i> DC.			3	H	forest edges	1	1	1
Compositae	<i>Lactuca serriola</i> L.			9	H	forest edges	1	2	0
Compositae	<i>Lapsana communis</i> L.			9	H	forest edges	1	2	0
Compositae	<i>Leucanthemum vulgare</i> Lam.			9	H	meadow	1	1	1

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Compositae	<i>Lactuca muralis</i> (L.) Fresen.			7	H	forest edges	1	1	1
Compositae	<i>Prenanthes purpurea</i> L.			8	H	forest edges	1	1	1
Compositae	<i>Solidago virgaurea</i> L.			9	H	forest edges	1	1	1
Compositae	<i>Sonchus asper</i> (L.) Hill			9	T	forest edges	1	2	0
Compositae	<i>Sonchus oleraceus</i> L.			1	T	forest edges	1	2	0
Compositae	<i>Taraxacum officinale</i> Weber			11	H	meadow	1	1	1
Compositae	<i>Tussilago farfara</i> L.			9	H	wet habitats	1	1	1
Compositae	<i>Aposeris foetida</i> (L.) Less.			3	H	forest edges	2	0	1
Compositae	<i>Arctium lappa</i> L.			9	H	forest edges	2	1	0
Compositae	<i>Artemisia verlotiorum</i> Lamotte		+	12	H	forest edges	2	1	0
Compositae	<i>Centaurea nigrescens</i> Willd.			3	H	meadow	2	0	1
Compositae	<i>Cirsium arvense</i> (L.) Scop.			9	G	forest edges	2	1	0
Compositae	<i>Crepis biennis</i> L.			7	H	forest edges	2	1	0
Compositae	<i>Doronicum austriacum</i> Jacq.			3	G	forest edges	2	0	1
Compositae	<i>Erigeron annuus</i> (L.) Pers.		+	12	H	forest edges	2	1	0
Compositae	<i>Eupatorium cannabinum</i> L.			9	H	forest edges	2	1	0
Compositae	<i>Petasites albus</i> (L.) Gaertn.			9	G	wet habitats	2	0	1
Compositae	<i>Petasites hybridus</i> (L.) P. Gaertn. , B. Mey. et Schreb.			9	G	wet habitats	2	0	1
Compositae	<i>Senecio ovatus</i> (P.Gaertn.,B.Mey. Et Scherb.) Willd.			3	H	forest edges	2	0	1
Compositae	<i>Solidago gigantea</i> Aiton		+	12	H	forest edges	2	1	0
Compositae	<i>Tanacetum corymbosum</i> (L.) Sch. Bip.			9	H	forest edges	2	0	1
Compositae	<i>Tanacetum macrophyllum</i> (Waldst. et Kit.) Sch. Bip.			5	H	forest edges	3	0	0
Compositae	<i>Tanacetum vulgare</i> L.			9	H	forest edges	3	0	0
Compositae	<i>Tripleurospermum</i> <i>inodorum</i> (L.) Sch.Bip.			4	T	forest edges			
Convolvulaceae	<i>Convolvulus arvensis</i> L.			9	H	thickets	1	2	0
Cornaceae	<i>Cornus mas</i> L.			3	P	thickets	3	0	0
Cornaceae	<i>Cornus sanguinea</i> L.			8	P	thickets	3	0	0
Corylaceae	<i>Carpinus betulus</i> L.			7	P	forest	3	0	0

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Corylaceae	<i>Corylus avellana</i> L.			8	P	thickets	3	0	0
Crassulaceae	<i>Sedum telephium</i> L.			12	H	orchards and tree plantations	1	0	2
Cupressaceae	<i>Thuja occidentalis</i> L.			12	P	orchards and tree plantations	3	0	0
Cyperaceae	<i>Carex flacca</i> Schreb.			8	G	forest edges	1	0	2
Cyperaceae	<i>Carex pendula</i> Huds.			9	H	forest edges	1	0	2
Cyperaceae	<i>Carex remota</i> L.			10	H	forest edges	1	0	2
Cyperaceae	<i>Carex sylvatica</i> Huds.			9	H	forest edges	1	1	1
Cyperaceae	<i>Carex vulpina</i> L.			9	H	forest edges	1	0	2
Cyperaceae	<i>Carex divulsa</i> Stokes			1	H	forest edges	2	0	1
Cyperaceae	<i>Carex hirta</i> L.			9	H	forest edges	2	1	0
Dioscoreaceae	<i>Tamus communis</i> L.			3	G	forest edges	2	0	1
Dipsacaceae	<i>Dipsacus pilosus</i> L.			9	H	forest edges	2	1	0
Dipsacaceae	<i>Knautia drymeia</i> Heuff.			2	H	forest edges	2	0	1
Dryopteridaceae	<i>Dryopteris filix-mas</i> (L.) Schott			11	G	forest	2	0	1
Dryopteridaceae	<i>Polystichum aculeatum</i> (L.) Roth			11	H	forest	2	0	1
Equisetaceae	<i>Equisetum telmateia</i> Ehrh.			8	G	forest edges	1	1	1
Equisetaceae	<i>Equisetum arvense</i> L.			10	G	forest edges	2	1	0
Euphorbiaceae	<i>Euphorbia helioscopia</i> L.			1	T	forest edges	0	3	0
Euphorbiaceae	<i>Euphorbia dulcis</i> L.			5	G	forest edges	1	1	1
Euphorbiaceae	<i>Euphorbia epithymoides</i> Kern.			4	Ch	forest edges	1	0	2
Euphorbiaceae	<i>Euphorbia amygdaloides</i> L.			9	Ch	forest edges	2	0	1
Euphorbiaceae	<i>Mercurialis perennis</i> L.			8	G	forest edges	2	0	1
Fabaceae	<i>Medicago lupulina</i> L.			9	T	meadow	0	2	1
Fabaceae	<i>Melilotus officinalis</i> (L.) Lam.			9	H	meadow	0	3	0
Fabaceae	<i>Lathyrus niger</i> (L.) Bernhardt			8	G	forest edges	1	1	1
Fabaceae	<i>Lathyrus pratensis</i> L.			9	H	meadow	1	1	1
Fabaceae	<i>Lathyrus vernus</i> (L.) Bernhardt			1	H	forest edges	1	0	2

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Fabaceae	<i>Lotus corniculatus</i> L.			9	H	meadow	1	1	1
Fabaceae	<i>Melilotus alba</i> Medik.			9	H	meadow	1	2	0
Fabaceae	<i>Trifolium pratense</i> L.			9	H	forest edges	1	1	1
Fabaceae	<i>Trifolium repens</i> L.			9	H	forest edges	1	1	1
Fabaceae	<i>Vicia cracca</i> L.			9	H	meadow	1	1	1
Fabaceae	<i>Vicia sativa</i> L.			1	T	meadow	1	2	0
Fabaceae	<i>Astragalus glycyphyllos</i> L.			9	H	thickets	2	0	1
Fabaceae	<i>Chamaecytisus supinus</i> (L.) Link			8	Ch	forest edges	2	0	1
Fabaceae	<i>Galega officinalis</i> L.			1	H	meadow	2	1	0
Fabaceae	<i>Genista januensis</i> L.			6	Ch	forest edges	2	0	1
Fabaceae	<i>Genista tinctoria</i> L.			5	Ch	forest edges	2	0	1
Fabaceae	<i>Lathyrus tuberosus</i> L.			9	H	meadow	2	1	0
Fabaceae	<i>Medicago sativa</i> L.			1	H	meadow	2	0	1
Fabaceae	<i>Trifolium rubens</i> L.			7	H	meadow	2	0	1
Fabaceae	<i>Vicia dumetorum</i> L.			9	H	meadow	2	0	1
Fabaceae	<i>Vicia oroboides</i> Wulfen			9	H	forest edges	2	0	1
Fabaceae	<i>Robinia pseudoacacia</i> L.		+	12	P	thickets	3	0	0
Fabaceae	<i>Coronilla varia</i> L.			8	H	meadow			
Fagaceae	<i>Quercus cerris</i> L.			3	P	forest	2	0	1
Fagaceae	<i>Quercus petraea</i> (Mattuschka) Liebl.			7	P	forest	2	0	1
Fagaceae	<i>Castanea sativa</i> Mill.			3	P	forest	3	0	0
Fagaceae	<i>Fagus sylvatica</i> L.			7	P	forest	3	0	0
Fumariaceae	<i>Corydalis solida</i> (L.) Swartz			9	G	forest edges	1	1	1
Fumariaceae	<i>Corydalis cava</i> (L.) Schweigg. et Koerte				G	forest edges			
Gentianaceae	<i>Gentiana asclepiadea</i> L.			3	H	forest edges	2	0	1
Geraniaceae	<i>Geranium robertianum</i> L.			10	H	forest edges	1	2	0
Geraniaceae	<i>Geranium phaeum</i> L.			3	H	forest edges	2	0	1
Ginkgoaceae	<i>Ginkgo biloba</i> L.			12	P	orchards and tree plantations			
Hypolepidaceae	<i>Pteridium aquilinum</i> (L.) Kuhn			11	G	forest edges	2	0	1
Iridaceae	<i>Crocus vernus</i> L.			3	G	forest	1	0	2

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Juglandaceae	<i>Juglans regia</i> L.			12	P	orchards and tree plantations	3	0	0
Juncaceae	<i>Luzula luzuloides</i> (Lam.) Dandy et Wilmott			7	H	forest edges	1	1	1
Juncaceae	<i>Luzula sylvatica</i> (Huds.) Gaudin			8	H	forest edges	2	0	1
Lamiaceae	<i>Lamium purpureum</i> L.			9	T	forest edges	0	3	0
Lamiaceae	<i>Ajuga reptans</i> L.			9	H	forest edges	1	1	1
Lamiaceae	<i>Calamintha nepetoides</i> Jord.			3	G	forest edges	1	1	1
Lamiaceae	<i>Galeopsis speciosa</i> Mill.			5	T	forest edges	1	2	0
Lamiaceae	<i>Glechoma hederacea</i> L.			9	H	forest edges	1	1	1
Lamiaceae	<i>Lamium album</i> L.			3	H	forest edges	1	2	0
Lamiaceae	<i>Lamium galeobdolon</i> (L.) L.			9	H	forest edges	1	1	1
Lamiaceae	<i>Lamium maculatum</i> L.			9	H	forest edges	1	1	1
Lamiaceae	<i>Lamium orvala</i> L.			2	H	forest edges	1	1	1
Lamiaceae	<i>Lycopus europaeus</i> L.			9	H	forest edges	1	0	2
Lamiaceae	<i>Melittis melissophyllum</i> L.			7	H	forest edges	1	0	2
Lamiaceae	<i>Mentha longifolia</i> (L.) Huds.			9	H	forest edges	1	1	1
Lamiaceae	<i>Prunella vulgaris</i> L.			10	H	meadow	1	1	1
Lamiaceae	<i>Salvia pratensis</i> L.			1	H	meadow	1	1	1
Lamiaceae	<i>Salvia verticillata</i> L.			3	H	meadow	1	1	1
Lamiaceae	<i>Stachys sylvatica</i> L.			9	H	forest edges	1	1	1
Lamiaceae	<i>Clinopodium vulgare</i> L.			9	G	forest edges	2	0	1
Lamiaceae	<i>Glechoma hirsuta</i> Waldst. et Kit.			10	H	forest edges	2	1	0
Lamiaceae	<i>Salvia glutinosa</i> L.			9	H	forest edges	2	0	1
Lamiaceae	<i>Stachys alpina</i> L.			8	H	forest edges	2	0	1
Lamiaceae	<i>Betonica officinalis</i> L.			8	H	meadow			
Liliaceae	<i>Erythronium dens-canis</i> L.			2	G	forest edges	1	0	2
Liliaceae	<i>Gagea lutea</i> (L.) Ker Gawl.			9	G	forest edges	1	1	1
Linaceae	<i>Linum catharticum</i> L.			9	T	meadow	0	1	2
Malvaceae	<i>Malva sylvestris</i> L.			9	H	forest edges	1	1	1
Malvaceae	<i>Malva alcea</i> L.			3	H	forest edges	2	0	1
Melanthiaceae	<i>Paris quadrifolia</i> L.	DD		9	G	forest edges	1	1	1

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Melanthiaceae	<i>Veratrum album</i> L.			9	H	forest edges	2	0	1
Oleaceae	<i>Fraxinus ornus</i> L.			3	P	thickets	3	0	0
Oleaceae	<i>Ligustrum vulgare</i> L.			9	P	thickets	3	0	0
Oleaceae	<i>Syringa vulgaris</i> L.			12	P	orchards and tree plantations	3	0	0
Onagraceae	<i>Epilobium montanum</i> L.	NT		9	H	forest edges	1	1	1
Onagraceae	<i>Circaea lutetiana</i> L.			9	H	forest edges	2	1	0
Orchidaceae	<i>Neottia nidus-avis</i> (L.) Rich.	VU		9	G	forest edges	0	0	3
Orchidaceae	<i>Cephalanthera damasonium</i> (Mill.) Druce	NT		3	G	forest edges	1	1	1
Orchidaceae	<i>Orchis purpurea</i> Huds.	VU		8	G	forest edges	1	1	1
Orchidaceae	<i>Cephalanthera rubra</i> (L.) Rich.			3	G	forest edges	1	1	1
Orchidaceae	<i>Epipactis helleborine</i> (L.) Crantz			9	G	forest edges	1	1	1
Orchidaceae	<i>Epipactis microphylla</i> (Ehrh.) Sw.			3	G	forest edges	1	1	1
Orchidaceae	<i>Platanthera bifolia</i> (L.) Rich.			9	G	forest edges	1	1	1
Orobanchaceae	<i>Orobanche gracilis</i> Sm.			1	G	forest edges	0	1	2
Oxalidaceae	<i>Oxalis acetosella</i> L.			11	H	forest	0	1	2
Oxalidaceae	<i>Oxalis fontana</i> Bunge			12	G	forest edges			
Papaveraceae	<i>Papaver rhoeas</i> L.			1	T	meadow	0	3	0
Papaveraceae	<i>Chelidonium majus</i> L.			9	H	rocks and walls	2	1	0
Pinaceae	<i>Cedrus deodara</i> (D. Don) G. Don			12	P	orchards and tree plantations	3	0	0
Pinaceae	<i>Larix decidua</i> Mill.			12	P	forest	3	0	0
Pinaceae	<i>Picea abies</i> L.			8	P	orchards and tree plantations	3	0	0
Pinaceae	<i>Picea pungens</i> Engelm.			12	P	orchards and tree plantations	3	0	0
Pinaceae	<i>Pinus nigra</i> J.F. Arnold			12	P	orchards and tree plantations	3	0	0
Pinaceae	<i>Pinus strobus</i> L.			12	P	forest	3	0	0

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Plantaginaceae	<i>Plantago lanceolata</i> L.			9	H	meadow	1	1	1
Plantaginaceae	<i>Plantago major</i> L.			9	H	meadow	1	1	1
Plantaginaceae	<i>Plantago media</i> L.			9	H	meadow	1	1	1
Poaceae	<i>Bromus sterilis</i> L.			9	T	meadow	0	3	0
Poaceae	<i>Cynosurus cristatus</i> L.			9	H	meadow	0	3	0
Poaceae	<i>Anthoxanthum odoratum</i> L.			9	H	meadow	1	1	1
Poaceae	<i>Brachypodium sylvaticum</i> (Huds) P.Beauv.			9	H	forest edges	1	1	1
Poaceae	<i>Briza media</i> L.			9	H	meadow	1	1	1
Poaceae	<i>Bromus hordaceus</i> L.			9	T	meadow	1	2	0
Poaceae	<i>Dactylis glomerata</i> L.			9	H	meadow	1	1	1
Poaceae	<i>Holcus lanatus</i> L.			9	H	meadow	1	1	1
Poaceae	<i>Melica nutans</i> L.			5	H	forest edges	1	1	1
Poaceae	<i>Poa annua</i> L.			11	T	meadow	1	2	0
Poaceae	<i>Poa trivialis</i> L.			9	H	forest edges	1	1	1
Poaceae	<i>Alopecurus pratensis</i> L.			9	H	meadow	2	0	1
Poaceae	<i>Arrhenatherum elatius</i> (L.) P. Beauv. ex J. Presl et C. Presl			8	H	meadow	2	1	0
Poaceae	<i>Lolium perene</i> L.			9	H	meadow	2	1	0
Poaceae	<i>Phragmites australis</i> (Cav.) Steud.			11	G	wet habitats	2	0	1
Polygalaceae	<i>Polygala comosa</i> Schkuhr			9	H	meadow	1	0	2
Polygonaceae	<i>Fallopia convolvulus</i> (L.) Á. Löve			11	T	thickets	1	2	0
Polygonaceae	<i>Fallopia dumetorum</i> (L.) Holub			9	T	thickets	1	2	0
Polygonaceae	<i>Rumex acetosa</i> L.			9	H	forest edges	1	1	1
Polygonaceae	<i>Rumex acetosella</i> L.			11	H	forest edges	1	1	1
Polygonaceae	<i>Rumex crispus</i> L.			11	H	forest edges	1	2	0
Polypodiaceae	<i>Polypodium vulgare</i> L.			11	H	forest edges	1	0	2
Primulaceae	<i>Anagallis arvensis</i> L.	NT		11	T	meadow	0	2	1
Primulaceae	<i>Cyclamen purpurascens</i> Mill.			12	G	forest	1	0	2
Primulaceae	<i>Lysimachia nummularia</i> L.			8	H	wet habitats	1	0	2
Primulaceae	<i>Lysimachia punctata</i> L.			5	H	forest edges	3	0	0

Family	Taxon	IUCN category	Invasive	Chorotype	Life-form	Habitat	C-strategy	R-strategy	S-strategy
Primulaceae	<i>Primula vulgaris</i> Huds.			10	H	forest			
Ranunculaceae	<i>Ranunculus ficaria</i> L.			7	G	wet habitats	0	2	1
Ranunculaceae	<i>Anemone nemorosa</i> L.			7	G	forest	1	1	1
Ranunculaceae	<i>Anemone ranunculoides</i> L.			9	G	forest	1	1	1
Ranunculaceae	<i>Hepatica nobilis</i> Schreber			7	H	forest	1	0	2
Ranunculaceae	<i>Isopyrum thalictroides</i> L.			9	G	forest edges	1	0	2
Ranunculaceae	<i>Ranunculus acris</i> L.			9	H	forest edges	1	1	1
Ranunculaceae	<i>Ranunculus bulbosus</i> L.			9	G	forest edges	1	1	1
Ranunculaceae	<i>Ranunculus repens</i> L.			9	H	forest edges	1	2	0
Ranunculaceae	<i>Aconitum lycoctonum</i> L. ssp. <i>vulparia</i> (Reichenb.) Nyam			9	H	forest edges	2	0	1
Ranunculaceae	<i>Ranunculus lanuginosus</i> L.			7	H	forest edges	2	0	1
Ranunculaceae	<i>Clematis vitalba</i> L.			8	P	thickets	3	0	0
Rosaceae	<i>Fragaria vesca</i> L.			9	H	rocks and walls	1	1	1
Rosaceae	<i>Geum urbanum</i> L.			11	H	meadow	1	1	1
Rosaceae	<i>Malus sylvestris</i> (L.) Mill.			8	P	thickets	1	1	1
Rosaceae	<i>Potentilla micrantha</i> Ramond ex DC.			3	H	forest edges	1	1	1
Rosaceae	<i>Potentilla reptans</i> L.			9	H	forest edges	1	1	1
Rosaceae	<i>Rubus idaeus</i> L.			9	N	thickets	1	1	1
Rosaceae	<i>Achillea millefolium</i> L.			9	H	meadow	2	1	0
Rosaceae	<i>Agrimonia eupatoria</i> L.			10	H	meadow	2	1	0
Rosaceae	<i>Aruncus dioicus</i> (Walter) Fernald			9	H	forest edges	2	0	1
Rosaceae	<i>Crataegus leavigata</i> (Poir.) DC.			8	P	thickets	2	0	1
Rosaceae	<i>Crataegus monogyna</i> Jacq.			9	P	thickets	2	0	1
Rosaceae	<i>Pyrus communis</i> L.			12	P	orchards and tree plantations	2	0	1
Rosaceae	<i>Rubus</i> sp.				N	thickets	2	0	1
Rosaceae	<i>Sorbus aria</i> (L.) Crantz			8	P	thickets	2	0	1
Rosaceae	<i>Sorbus torminalis</i> (L.) Crantz			9	P	thickets	2	0	1
Rosaceae	<i>Cydonia oblonga</i> Mill.			12	P	orchards and tree plantations	3	0	0

Family	Taxon	IUCN category	Invasive	Chorotype	Life-form	Habitat	C-strategy	R-strategy	S-strategy
Rosaceae	<i>Mespilus germanica</i> L.			12	P	orchards and tree plantations	3	0	0
Rosaceae	<i>Prunus avium</i> L.			9	P	thickets	3	0	0
Rosaceae	<i>Prunus domestica</i> L.			12	P	orchards and tree plantations	3	0	0
Rosaceae	<i>Prunus laurocerasus</i> L.			12	P	orchards and tree plantations	3	0	0
Rosaceae	<i>Prunus persica</i> (L.) Batsch			12	P	orchards and tree plantations	3	0	0
Rosaceae	<i>Rosa arvensis</i> Huds.			7	Ch	forest edges	3	0	0
Rosaceae	<i>Rosa canina</i> L.			9	P	thickets	3	0	0
Rubiaceae	<i>Cruciata glabra</i> (L.) Ehrend.			3	H	meadow	1	1	1
Rubiaceae	<i>Galium aparine</i> L.			9	T	forest edges	1	2	0
Rubiaceae	<i>Galium mollugo</i> L.			9	H	meadow	1	1	1
Rubiaceae	<i>Galium verum</i> L.			9	H	meadow	1	1	1
Rubiaceae	<i>Cruciata laevipes</i> Opiz			3	H	meadow	2	1	0
Rubiaceae	<i>Galium odoratum</i> (L.) Scop.			9	G	forest edges	2	0	1
Rubiaceae	<i>Galium sylvaticum</i> L.			7	G	forest edges	2	0	1
Salicaceae	<i>Populus alba</i> L.			9	P	wet habitats	3	0	0
Salicaceae	<i>Populus tremula</i> L.			7	P	forest edges	3	0	0
Salicaceae	<i>Salix alba</i> L.			9	P	wet habitats	3	0	0
Salicaceae	<i>Salix caprea</i> L.			9	P	forest edges	3	0	0
Santalaceae	<i>Viscum album</i> L.			9	Ch	forest	0	0	3
Sapindaceae	<i>Koelreuteria paniculata</i> Laxm.			12	P	thickets	3	0	0
Saxifragaceae	<i>Chrysosplenium alternifolium</i> L.			10	H	wet habitats	1	0	2
Scrophulariaceae	<i>Lathraea squamaria</i> L.			9	G	forest	0	0	3
Scrophulariaceae	<i>Melampyrum nemorosum</i> L.			9	T	forest edges	0	2	1
Scrophulariaceae	<i>Rhinanthus minor</i> L.			9	T	meadow	0	2	1
Scrophulariaceae	<i>Linaria vulgaris</i> Mill.			9	G	meadow	1	1	1
Scrophulariaceae	<i>Scrophularia nodosa</i> L.			9	H	forest edges	1	1	1

Family	Taxon	IUCN category	Invasive	Chorotype	Life-form	Habitat	C-strategy	R-strategy	S-strategy
Scrophulariaceae	<i>Verbascum nigrum</i> L.			9	H	forest edges	1	1	1
Scrophulariaceae	<i>Veronica chamaedrys</i> L.			9	Ch	meadow	1	1	1
Scrophulariaceae	<i>Veronica persica</i> Poir.		+	12	T	meadow	1	2	0
Scrophulariaceae	<i>Veronica serpyllifolia</i> L.			9	H	forest edges	1	1	1
Scrophulariaceae	<i>Scrophularia umbrosa</i> Dumort.	DD		9	H	forest edges	2	0	1
Scrophulariaceae	<i>Scrophularia scopolii</i> Hoppe			9	H	forest edges	2	0	1
Scrophulariaceae	<i>Veronica officinalis</i> L.			9	H	meadow	2	0	1
Scrophulariaceae	<i>Veronica urticifolia</i> Jacq.			7	Ch	forest edges	2	0	1
Simaroubaceae	<i>Ailanthus altissima</i> (Mill.) Swingle			12	P	thickets	1	2	0
Solanaceae	<i>Solanum nigrum</i> L.			10	T	forest edges	0	3	0
Solanaceae	<i>Atropa bella-donna</i> L.			9	H	forest edges	1	1	1
Solanaceae	<i>Scopolia carniolica</i> Jacq.			2	H	forest edges	1	1	1
Solanaceae	<i>Solanum dulcamara</i> L.			9	Ch	forest edges	1	1	1
Solanaceae	<i>Physalis alkekengi</i> L.			3	H	forest edges	2	0	1
Staphyleaceae	<i>Staphylea pinnata</i> L.	NT		9	P	thickets	3	0	0
Thymelaeaceae	<i>Daphne laureola</i> L.	NT		4	N	forest edges	2	0	1
Thymelaeaceae	<i>Daphne mezereum</i> L.			9	P	forest edges	2	0	1
Tiliaceae	<i>Tilia cordata</i> Mill.			7	P	forest edges	3	0	0
Ulmaceae	<i>Ulmus glabra</i> Huds.			7	P	thickets	2	0	1
Urticaceae	<i>Parietaria officinalis</i> L.			3	H	rocks and walls	1	1	1
Urticaceae	<i>Urtica dioica</i> L.			9	H	forest edges	2	1	0
Verbenaceae	<i>Verbena officinalis</i> L.			9	T	forest edges	1	2	0
Violaceae	<i>Viola arvensis</i> Murray			9	T	meadow	0	3	0
Violaceae	<i>Viola canina</i> ssp. <i>montana</i> (L.) Hartm.			9	H	forest	1	0	2
Violaceae	<i>Viola alba</i> Besser			7	H	forest	2	0	1
Violaceae	<i>Viola reichenbachiana</i> Jord. ex Boreau			7	H	forest	2	0	1
Vitaceae	<i>Vitis vinifera</i> L.			12	P	orchards and tree plantations	3	0	0
Woodsiaceae	<i>Gymnocarpium robertianum</i> (Hoffm.) Newman			10	G	rocks and walls	1	0	2
Woodsiaceae	<i>Athyrium filix-femina</i> (L.) Roth			10	H	forest			

Appendix 2. The list of bryophytes (*Bryophyta*) recorded in the area of "Zelinska glava" (Abbreviation: **Chorotype:** E1 (2 – boreo-arctic montane, 5 – boreo-temperate, 6 – wide temperate, 7 – temperate, 8 – southern-temperate), E2 (2 – Suboceanic, 3 – European and 6 – Circumpolar))

Family	Taxon	E1	E2
Amblystegiaceae	<i>Campylium protensum</i> (Brid.) Kindb.	5	6
Anomodontaceae	<i>Anomodon attenuatus</i> (Hedw.) Hüb.	5	6
Anomodontaceae	<i>Anomodon viticulosus</i> (Hedw.) Hook. & Taylor	5	6
Brachytheciaceae	<i>Brachythecium rivulare</i> Schimp.	5	6
Brachytheciaceae	<i>Eurhynchium angustirete</i> (Broth.) T.J.Kop.	-	-
Fissidentaceae	<i>Fissidens dubius</i> P.Beauv.	7	3
Fissidentaceae	<i>Fissidens taxifolius</i> Hedw.	8	3
Hylocomiaceae	<i>Ctenidium molluscum</i> (Hedw.) Mitt.	5	3
Hypnaceae	<i>Hypnum cupressiforme</i> Hedw.	6	6
Leucobryaceae	<i>Leucobryum glaucum</i> (Hedw.) Ångstr.	7	3
Polytrichaceae	<i>Polytrichum formosum</i> Hedw.	5	6
Pottiaceae	<i>Tortella tortuosa</i> (Hedw.) Limpr.	5	6
Pseudolepicoleaceae	<i>Blepharostoma trichophyllum</i> (L.) Dumort.	2	6
Scapaniaceae	<i>Diplophyllum albicans</i> (L.) Dumort.	5	2