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The very early-succession herbaceous vegetation in the 'Vaia' windstorm clearings within the Italian southeastern pre-Alpine mountain belt (Veneto and Trentino)

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Key words: Asiago Plateau, *Epilobietea angustifolii*, *Galeopsis* sp. pl., Lagorai Range, phytosociology, vegetation dynamic.

Ključne besede: plato Asiago, *Epilobietea angustifolii*, *Galeopsis* sp. pl., gorska veriga Lagorai, fitocenologija, dinamika vegetacije.

Abstract

The very early herbaceous vegetation which established in the clearings following 2018 'Vaia' storm was investigated in some pre-Alpine areas of Northeast Italy, on calcareous as well as acidic substrata. Sixty-two original vegetation-plot records were executed in spruce or mixed beech-silver fir-spruce blowdown forests, within two years after the salvage logging had been completed. According to different origin and degree of soil disturbance, different communities were recognised. *Galeopsis pubescens* and *G. tetrahit* rich stands develop as ephemeral annual associations at the beginning of the regeneration succession where partially decomposed coniferous needles and twigs have accumulated in the litter. Soils with altered profiles due to forestry machineries harbour dominance of perennial herbaceous species (especially *Senecio nemorensis* agg., *Atropa bella-donna*, *Epilobium angustifolium*) which origin as many already recognised associations or vegetation types we ascribed to community level. All coenoses belong to *Epilobietea angustifolii* class, with the exception of *Calamagrostis arundinacea*-rich stands on undisturbed base-rich as well as base-poor soils, whose syntaxonomic positions are unclear.

Izvleček

Preučevali smo zgodnjo zeliščno vegetacijo na karbonatni in kisli podlagi gozdnih čistin, ki so nastale po neurju 'Vaia' leta 2018 v nekaterih območjih Predalp v severovzhodni Italiji. Naredili smo 62 fitocenoloških popisov v mešanih bukovo-jelovo-smrekovih gozdovih po vetrolomu, dve leti po dokončani sanitarni sečnji. Glede na različen izvor in stopnjo motenosti tal, smo opisali različne rastlinske združbe. Sestoji s prevladujočima vrstama *Galeopsis pubescens* in *G. tetrahit* se razvijejo kot efemerne enoletne združbe na začetku sukcesije na mestih, kjer se v opadu akumulirajo delno razpadle iglice in vejice iglavcev. Na tleh s spremenjenim talnim profilom zaradi gozdne mehanizacije prevladujejo zelnate trajnice (predvsem *Senecio nemorensis* agg., *Atropa bella-donna*, *Epilobium angustifolium*), ki smo jih uvrstili v že dosedaj opisane asociacije oziroma vegetacijske tipe. Vse združbe uvrščamo v razred *Epilobietea angustifolii*, z izjemo sestojev s prevladujočo vrsto *Calamagrostis arundinacea* na nemotenih tleh, tako na bogatih kot siromašnih z bazami, katerih sintaksonomski položaj je še nejasen.

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Introduction

The storm event 'Vaia' in late October 2018 struck large parts of the Alpine region. In particular, between 29 October and 30 October, the extraordinary event took the form of particularly intense rainfall, but especially of violent gusts of sirocco. In north-eastern Italy the wind exceeded 150-200 km/h causing a substantial damage or the complete destruction of the forest on 42500 hectares and the downing of approximately $8.5\cdot10^6$ m^3 of timber (Chirici et al., 2019). These data make Vaia the event with the greatest impact on forest ecosystems ever recorded to date in Italy, the most affected administrative regions being Trentino-Alto Adige and Veneto (Chirici et al., 2019). The extensive and radical disturbance mainly disrupted established *Picea* or *Picea-Abies* woods (Sitzia & Campagnaro, 2019; AA.VV, 2020).

The arised new conditions at ground level after disturbance favour (1) pioneer plants starting the colonization of the bare soil and/or (2) species, present before the disturbance, invading competition-free space. This implies the ecological concept of succession, i.e. change in species composition and structure of a community through time (Pickett et al, 2013). In particular, from the perspective of vegetation dynamic, the recovery of an entire plant community after an extensive environmental injure represents a case of regeneration succession (Van der Maarel, 1996). The phenomenon develops through seral stages: in the early phases residual species, remnant vegetative structures, seed bank and inflow of short-lived species with extensive dispersal capacities play an important role in the assembly of temporary communities, whereas environmental factors and inter-specific competition are drivers of late stages of forest regeneration (e.g. Harper, 1977; Halpern, 1989; Verheien et al., 2003; Pickett et al., 2013). It was suggested

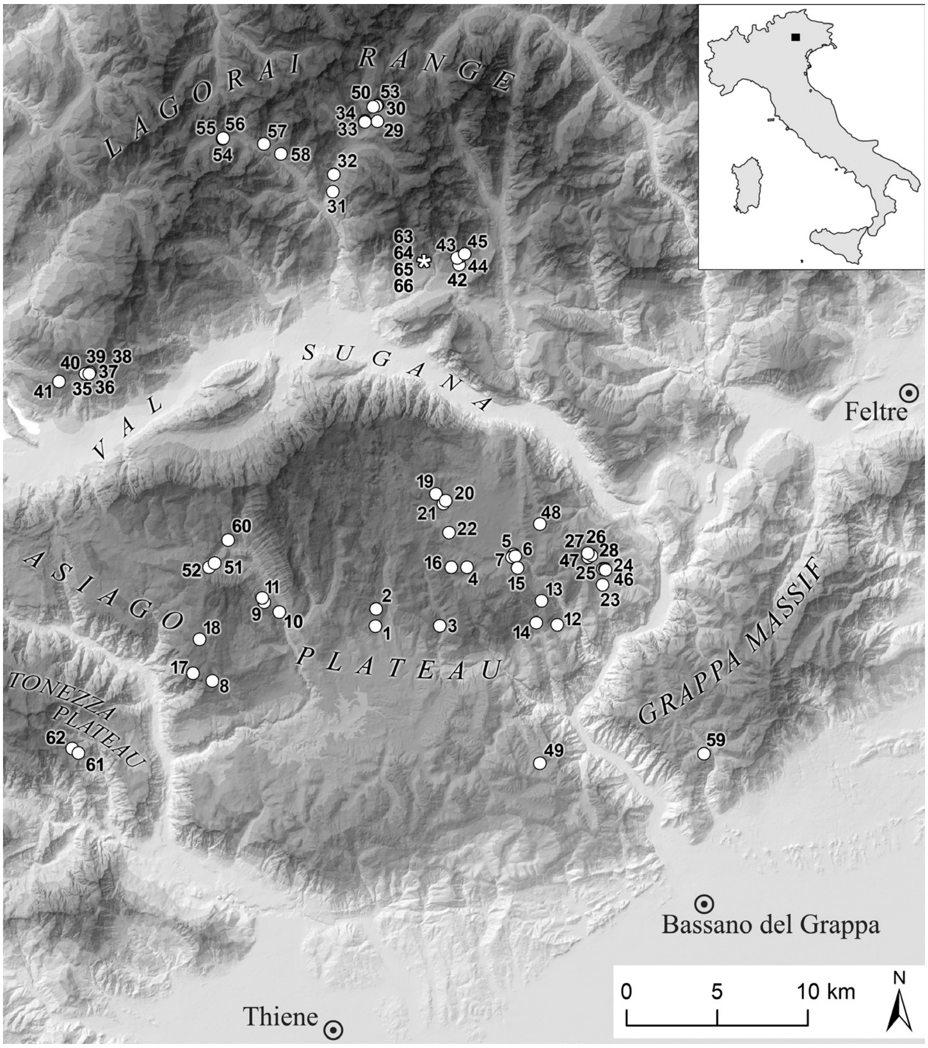

Figure 1: The upland regions of the study area with the geographical position of the relevés in the context of south-eastern pre-Alps. White star symbol indicates an approximate location of the 4 previously published relevés.

Slika 1: Hriboviti predeli preučevanega območja z geografskim položajem popisov v JV Predalpah. Bela zvezda predstavlja približno lokacijo štirih predhodno objavljenih popisov.

that early successional stages in forest recovery relies on both deterministic and also stochastic components (Halpern, 1989). Also the size of gaps and clearings are important in determining the type of developing community because in a large forest-clearing heavy-fruited and shade-tolerant species have lesser dispersal abilities and colonizing facility than light seed and light-demanding species (Grubb, 1977).

The consequences of the management practice of recovering economically valuable blow down timber, before its deterioration, i.e. the salvage logging or post-disturbance logging, add to the complex of variables that underlie the regeneration succession. The practice interfers with biological legacies, on which the ecosystem recovery depend, impairs natural vegetation recovery, facilitates the colonization of invasive species and alter soil properties and nutrient levels (Lindenmayer & Noss, 2006). Tree seedling and sapling survival is associated with pit-mound microtopography, i.e. microsites originating when mature trees are uprooted by a storm (Ulanova, 2000).

From the phytosociological point of view, early gap and clearing herbaceous communities belong to *Epilobietea angustifolii*, whereas late shrubland stages, not covered by the present study, are included in *Robinietea* (*Sambuco-Salicion capreae*). The aim of the present contribution is to analyse the very early clearing herbaceous communities which established soon after post-disturbance logging following 2018 'Vaia' storm, i.e. communities included in *Epilobietea angustifolii*. At the same time it was an opportunity not to be missed to investigate on a class little or none known in Italy (https://www.prodromo-vegetazione-italia.org/scheda/atropion-belladonnae/496; https://www.prodromo-vegetazione-italia.org/scheda/epilobion-angustifolii/497).

Study area

The vegetation relevés were mainly executed in the Asiago Plateau (Veneto) and in the Lagorai Range (Trentino); only three relevés were collected outside these territories, particularly two come from the Tonezza Plateau (Veneto) and one from the Grappa Massif (Veneto). According to the SOIUSA classification of the Alps (Marazzi, 2006), Asiago Plateau, Tonezza Plateau and Grappa Massif belong to the Venetian pre-Alps, whereas the Lagorai Range belongs to the Southern Dolomites of Fiemme.

The Asiago Plateau extends over 600 km^2, ranging from 600 m to over 2300 m a.s.l at borders between the Veneto Region and the Trento Province in North-Eastern Italy. The vegetation surveys were carried out in the mountain and high-mountain belts of the northern plateau, the geomorphological subunit stretching north of the about 1500 m high peaks which separate it from the underlying subunit of the median basin, where the main inhabited centers are located (Pellegrini & Sauro, 1994). The stratigraphic sequence consists of carbonate rocks: outcrops of Main Dolomite, Calcari Grigi Group, Rosso Ammonitico Veronese and Maiolica are widespread in the survey areas (Barbieri & Grandesso, 2007). After the extensive forest destruction caused by the conflicts of the First World War, studied territories were predominantly afforested with *Picea abies*. *Fagus*-woods or near-natural mixed *Abies-Fagus*(*-Picea*) forests (cf. *Dentario pentaphylli-Fagetum*, *Anemono trifoliae-Abietetum*) were in this way largely substituted by even-aged *Picea abies* woods which were hit by the 2018 Vaia windstorm. Tonezza Plateau and Grappa Massif share with Asiago Plateau main geological and vegetational features.

The Lagorai mountain chain, extending in south-eastern Trento Province, culminates at Cima di Cece over 2700 m a.s.l. Relevés involved mountain and sub-alpine belts of the southern part of the chain, in an area bounded on the north by a line joining the Val dei Mocheni, the Val Calamento and the Val Campelle, between 1100 m and 1750 m a.s.l. As regards geological outcrops, Lagorai is mainly constitued of porphyric, acid rocks belonging to the Atesina Porphyric Platform, but in the southern part of the chain metamorphic rocks of the Pre-Permian crystalline basement are widespread (Tomasi, 2019). Vegetation-plot records were collected on outcrops of Quartz Phyllade, porphyric rocks, granite and vulcanite moraine deposits (http://sgi.isprambiente.it/geologia100k/mostra_foglio.aspx?numero_foglio=21 http://sgi.isprambiente.it/geologia100k/mostra_foglio.aspx?numero_foglio=22).

At lower altitudes mixed *Fagus-Abies-Picea* forests occur (cf. *Luzulo albidae-Fagetum*), whereas *Picea abies* pure stands prevail at subalpine level (cf. *Luzulo nemorosae-Piceetum*).

Bioclimatic features of the study area were derived from thermopluviometric data of i) Asiago station (1016 m a.s.l.; https://www.arpa.veneto.it) for the Altipiano di Asiago and ii) Telve station (925 m a.s.l.; http://www.climatrentino.it/clima_trentino/ct_clima_dati_grafici) for the Lagorai Range. According to the Worldwide Bioclimatic Classification System (Rivas-Martínez et al., 2011), both central basin of the Asiago Plateau and southern mountain sector of the Lagorai chain belong to the temperate-oceanic bioclimate, upper supra-temperate thermotype, but the former has a lower hyperhumid ombrotype, whereas the latter has an upper humid ombrotype (Figure 2). A slight continentalization degree is likely at some relevé sites situated at higher altitude than the meteorological stations.

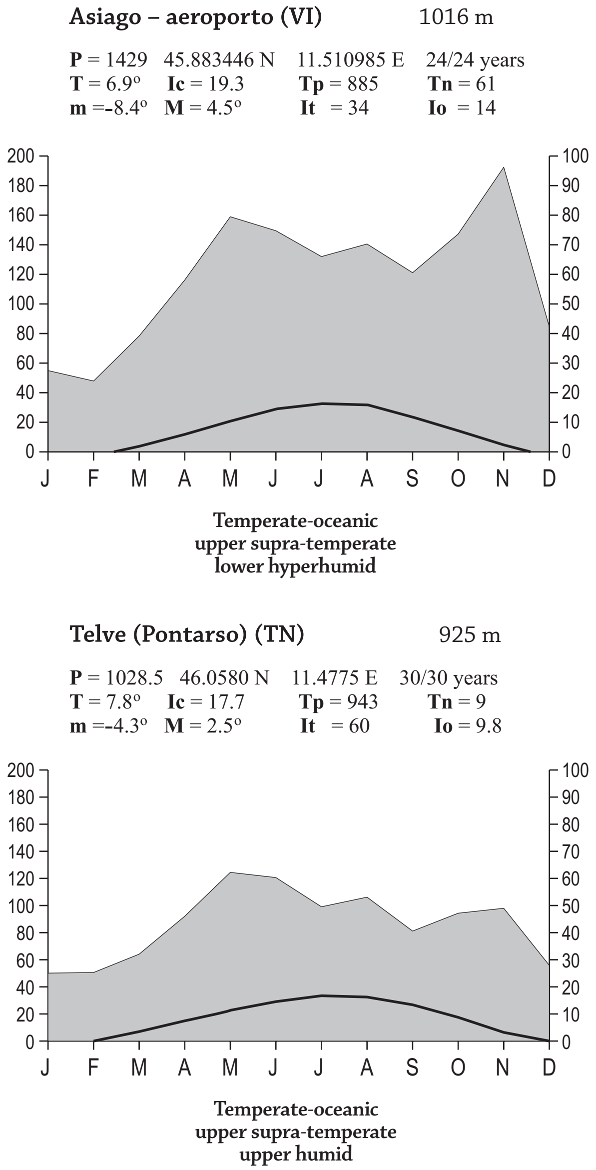

Figure 2: Climograms of Asiago (Asiago Plateau) and Telve (Lagorai Range) thermopluviometric stations.

Slika 2: Klimadiagram meteoroloških postaj Asiago (planota Asiago) in Telve (gorska veriga Lagorai).

Materials and Methods

The early pioneer herbaceous vegetation evolving on south-eastern pre-alpine clearings following the 2018 windstorm 'Vaia' was investigated by means of the standard Central European phytosociological method (Braun-Blanquet, 1964). We performed a total of 62 original relevés, 39 on calcareous substrata and 27 on siliceous ones, to which 4 published relevés coming from a previous minor event occurred in one of the two investigated area (Lagorai Range; Venanzoni, 1989) were added for statistical analyses (Figure 1). Original stands were surveyed in the second or third growing season after the 2018 autumn storm event, in 2020 and 2021 summers, i.e. within two years after the salvage logging had been completed. Species cover data, collected taking into account the 2-value modifications (*2a* and *2b*) proposed by Barkman et al. (1964), were converted in the corresponding average percentage values according to Gigante et al. (2012; see Figure 1: Braun Blanquet modified by Barkman et al., 1964) and, finally, these latter were square root transformed. First we proceeded with the classification of the 66 relevés, then the synthetic tables we obtained from the identified clusters were put in comparison with synthetic tables of similar *Epilobietea* coenoses from Central Europe. In this respect, the following associations were selected (in brackets the acronym used in the analysis results is also given):

Arctietum nemorosi (Tab. 132: column 6, in Oberdorfer, 1993; Arc n_G)

Arctietum nemorosi (Tab. 5: ass. B.2.1.2, in Dengler et al., 2007; Arc n_G*)

Arunco vulgaris-Lunarietum redivivae (Tab. 8: column XDC03, in Petrik et al. (2009); Aru-L_Cz)

Atropetum bellae-donnae (Tab. 132: column 5c, in Oberdorfer (1993); Atr b_G)

Atropo-Digitalietum luteae (Tab. 130: column 4, in Oberdorfer (1993); Atr-D_G)

Calamagrostio arundinaceae-Digitalietum grandiflorae (Tab. 130: column 3, in Oberdorfer (1993); Cal-D_G)

Cirsium-Ges. (Tab. 132: column 5a, in Oberdorfer (1993); Cir_G)

Corydalido claviculatae-Epilobietum angustifolii (Tab. 4: ass. B.1.1.2, in Dengler et al. (2007); Cor-E_G*)

Digitali purpureae-Epilobietum angustifolii (Tab. 130: column 1, in Oberdorfer (1993); Dig-E_G)

Digitali purpureae-Epilobietum angustifolii (Tab. 10: column XEA02, in Petrik et al. (2009); Dig-E_Cz)

Digitali-Senecionetum ovati (Tab. 10: column XEA05, in Petrik et al. (2009); Dig-S_Cz)

Epilobio montani-Geranietum robertiani (Tab. 8: column XDC02, in Petrik et al. (2009); Epi-G_Cz)

Epilobio montani-Geranietum robertiani (Tab. 169: column 23, in Oberdorfer (1993); Epi-G_G)

Fragaria vesca-Festuca gigantea-Ges. (Tab. 5: ass. B.2.1.1, in Dengler et al. (2007); Fra_G*)

Galeopsio pubescentis-Impatientum parviflorae (Tab. 1: column e, in Passarge (1997); Gal-I_G)

Gymnocarpio dryopteridis-Athyrietum filicis-feminae (Tab. 10: column XEA07, in Petrik et al. (2009); Gym-A_Cz)

Junco effusi-Calamagrostietum villosae (Tab. 10: column XEA04, in Petrik et al. (2009); Rub-C_Cz)
Pteridietum aquilini (Tab. 10: column XEA06, in Petrik et al. (2009); Pte a_Cz)
Rubo idaei-Calamagrostietum (Tab. 10: column XEA03, in Petrik et al. (2009); Rub-C_Cz)
Senecioni-Epilobietum angustifolii (Tab. 130: column 2, in Oberdorfer (1993); Sen-E_G)
Senecioni-Epilobietum angustifolii (Tab. 4: ass. B.1.1.1, in Dengler et al. (2007); Sen-E_G*)
Senecioni fuchsii-Galeopsietum tetrahit (Tab. 2: column r, in Passarge (1981); Sen_G)
Senecionetum fuchsii (Tab. 134: column 7, in Oberdorfer (1993); Dig-S_G)
Senecioni-Epilobietum angustifolii (Tab. 10: column XEA01, in Petrik et al. (2009); Sen-E_Cz)
Stachyo sylvaticae-Impatientetum noli-tangere (Tab. 8: column XDC01, in Petrik et al. (2009); Sta-I_Cz)

In the comparisons with the European communities, relationships of our synthetic tables were individually tested, otherwise the common territorial floristic matrix resulted in returning misleading clusters, with the original synthetic tables grouping all together and separating from the block of European ones. The same case occurred with the here used synthetic tables of Dengler et al. (2007) which team up each other excluding relationships with synthetic data representing at national level the same coenosis (i.e. Oberdorfer, 1993) (Figure 5). Since Passarge's synthetic table data (1981; 1997) are given through frequency classes, in the analyses we entered the central value of each range; in the same tables 'D' or 'd' indicating differential species of subassociation or variant, occurring without frequency values, were arbitrarily replaced with a 5% (i.e. the central value of the lowest frequency class).

The nomenclature source for the names of species are prevalently Bartolucci et al. (2018) for native ones and Galasso et al. (2018) for alien species. The sociology of the species was derived from crosschecking of data in Oberdorfer (1993), Mucina (1993), Theurillat et al. (1995), Dengler et al. (2007), de Foucault & Catteau (2015) and Mucina et al. (2016). The synecology of the surveyed communities was partially investigated through the recently published ecological indicator values at European level (Dengler et al., 2023) using not square root-transformed cover weighted values. With the same data, the biological and chorological spectra of the new described association were calculated, using information given in Pignatti (2005). Analyses were carried out with the program package Syn-Tax 2000 (Podani, 2001).

Results and Discussion

The classification of the 66 relevés (62 original plus 4 previously published) resulted in the dendrogram of Figure 3. The recognised communities differ in structure due to rate and coverage of annual and biennial species vs. herbaceous perennial plants. Hence, the communities are presented according to the predominance of therophytes rather than perennial species.

Therophyte-rich communities

Two main coenoses with largely predominating *Galeopsis* sp. pl. were detected. *Galeopsis* L. includes typical summer annual species. Due to the invasive behaviour of *Galeopsis pubescens* and *G. tetrahit*, in the second and third summer after the autumn windstorm, almost pure stands arise on poorly-humified organic horizon conserving partially decomposed coniferous organic matter. Both species give rise to a therophyte vegetation with ephemeral features. The two *Galeopsis* species are mostly mutually exclusive in predominating the different coenoses they form on nutrient-rich or nutrient-poor substrates. According to cluster analysis therophyte-rich stands dominated by *Galeopsis* sp. pl. separate in two clusters: *G. pubescens*-rich relevés group in cluster A, whereas *G. tetrahit*-rich relevés join in cluster H (Figure 3). Contrary to what may be expected, the different lithological matrices do not affect the aggregation of *G. pubescens*-dominating relevés: vegetation plots mix and aggregate together regardless they come from calcareous or acidic areas.

Galeopsis seeds have no adaptation to long-distance dispersal; the genus produces heavy, great-size nutlets which are dispersed by animals (zoochory) or man (hemerocory) (Kleyer et al., 2008), so the early establishment of dense populations is likely due to seed banks formed, at least in the Asiago Plateau, before the afforestation following the end of the Great War I. In 2–3 year old clear-cut areas in northern Europe spruce forests it was suggested that the extensive colonization of *Galeopsis bifida* was based on a persistent seed bank in soil (Hintikka, 1987). *Galeopsis tetrahit* has proved to exhibit a long-term persistent seed bank, with buried seeds capable of germinating 40 years after the conversion of arable land into pasture (Chippindale & Milton, 1934). As germination in species forming persistent seed bank is inhibited by darkness (Grime, 2001), it is probable that the large light availability produced by the 2018 wide windstorm clearings resulted in suitable growing conditions for *Galeopsis* species dormant seeds. Nitrification processes produced considerable amounts of nitrate useful for the summer rapid growth of seedlings and establishment of mature specimens. The high cover values of *G. pubescens* or *G. tetrahit* typically culminates in the second-third season after disturbance, as observed also in Bohemian *Fagus* (Slavíková, 1958: *G. pubescens*) and *Picea abies* woods (Hintikka, 1987: *G. bifida*). In conifer forests, also Halpern (1989) found that annuals like *Senecio sylvaticus* and *Conyza canadensis* peak in abundance 2 years after heavy disturbance. *Galeopsis tetrahit*, which is treated also as a *Papaveretea rhoeadis* characteristic species (Mucina et al., 2016), and *G. speciosa* are considered as differential species of *Galeopsio tetrahit-Galinsogetum parviflorae* sensu Poldini et al., a weed coenosis thriving in potato and bean fields in the montane belt of Carnic and Julian Alps (Poldini et al., 1998; Šilc & Čušin, 2005). In the same way, *G. pubescens* occurs sometimes abundant in potato fields, after harvesting, in the calcareous Asiago Plateau (Tasinazzo, 2023).

Clinopodio grandiflori-Galeopsietum pubescentis ass. nova hoc loco (cluster A in Table 1)

Differential species. *Galeopsis pubescens* (dom)

Floristic composition. The physiognomy of the community arises from the overwhelming dominance of *Galeopsis pubescens* which may be accompanied by a rarely abundant *Galeopsis tetrahit*. In the area where the study was carried out, *G. pubescens* is represented by the form with corolla of pale yellow colour, often with little violet spots, resulting in a coenosis from distance recognizable at blooming time. (Figure 4). The therophyte component includes also *Moehringia trinervia* (IV frequency class), *Geranium robertianum* and *Cardamine impatiens* (II). Herbaceous perennials are often represented by immature individuals and are scattered and of marginal importance at this time, with only *Epilobium montanum*, *Fragaria vesca* (V frequency class) and *Urtica dioica* (IV) occurring with a certain constancy degree. *Rubus idaeus* is here represented by only *juvenile* specimens.

According to a known framework (e.g. Aichinger, 1933; Passarge, 1981; Foucault & Catteau, 2015), studied large

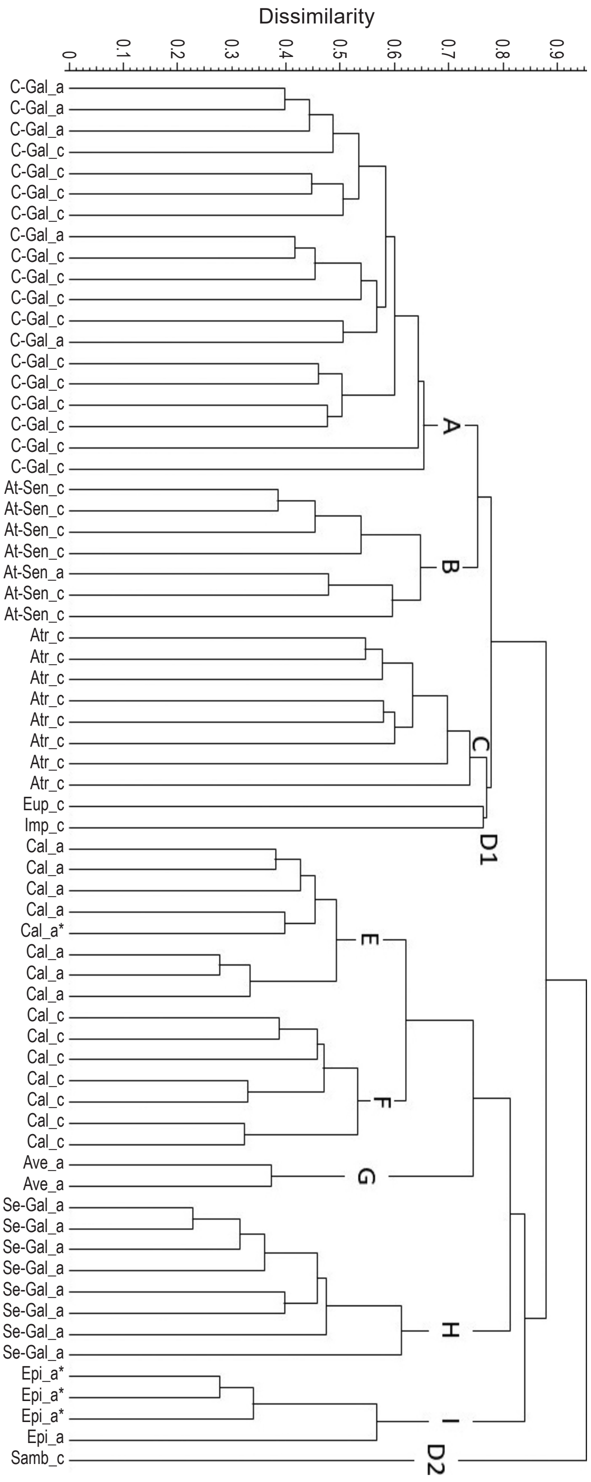

Figure 3: Dendrogram of relevés of early successional herbaceous stages of windstorm forest clearings in the study areas of south-eastern Italian pre-Alps (A – *Clinopodio grandiflori-Galeopsietum pubescentis*, B – *Athyrio filicis-feminae-Senecionetum glabrati*, C – *Atropetum bellae-donnae*, D1 – *Eupatorium cannabinum* comm. and *Impatiens glanduliferae* comm., E+F – *Calamagrostis arundinacea* communities, G – *Avenula flexuosa* var., H – *Senecioni fuchsii-Galeopsietum tetrahit*, I – *Epilobium angustifolium* comm., D2 – *Sambucus ebulus* comm.). UPGMA-Bray-Curtis. _a: acidic substratum, _c: basic substratum, *: published relevè (Venanzoni, 1989).

Slika 3: Dendrogram fitocenoloških popisov zgodnjih sukcesijskih zeliščnih stadijev na gozdnih čistinah, nastalih v preučevanih območjih v JV italijsnakih Predalpah. (A – *Clinopodio grandiflori-Galeopsietum pubescentis*, B – *Athyrio filicis-feminae-Senecionetum glabrati*, C – *Atropetum bellae-donnae*, D1 – združba z vrsto *Eupatorium cannabinum* in združba z vrsto *Impatiens glanduliferae*, E+F – združbe z vrsto *Calamagrostis arundinacea*, G – *Avenula flexuosa* var., H – *Senecioni fuchsii-Galeopsietum tetrahit*, I – združba z vrsto *Epilobium angustifolium*, D2 – združba z vrsto *Sambucus ebulus*). UPGMA-koeficient Bray-Curtis. _a: kisla podlaga, _c: bazična podlaga, *: objavljeni vegetacijski popisi (Venanzoni, 1989).

forest blowdown resulted in the mixture of species coming from various phytosociological classes. Expected character species of clearing vegetation (*Epilobietea*) and seral forest-clearing successional communities (*Robinietea*) are accompanied by several understory forest legacies (*Carpino-Fagetea*, *Vaccinio-Piceetea*) that persist through the initiating disturbance: more frequently, *Moehringia trinervia*, *Hieracium murorum*, *Oxalis acetosella*, *Mycelis muralis*, *Dryopteris filix-mas*. Meadow and pasture species (*Veronica chamaedrys*, *Veronica officinalis*), eutrophic tall-herb indicators (*Senecio cacaliaster*) and, less frequently, short-lived perennial ruderal (*Artemisietea*) also occur. The form on acidic substrate is differentiated by acidophilous components, more frequently *Luzula luzuloides*, *Calamagrostis arundinacea*, *Atocion rupestre*. The average species number per stand is 28.2.

Biological and chorological spectra. Life forms (%). Therophytes 68.4, hemicryptophytes 15.2, nanophanerophytes 9.3, geophytes 4.1, phanerophytes 2.5, chamaephytes 0.5.

Chorological spectrum (%). Eurasiatic 83.1, Boreal 9.2, orophytes 4.0, Cosmopolitan 2.3, Mediterranean 1.1, alien 0.2, Atlantic 0.1, endemic 0.1

Syntaxonomy. The phytosociological framing of this community has caused some uncertainty, starting from the highest syntaxonomical level. *Epilobietea angustifolii* class encompasses tall-herb perennial – not therophyte-rich (a/n) – vegetation in forest clearings in the temperate zones of Eurasia (Mucina et al., 2016). Due to ecological reasons, floristic similarities and plant life forms, Passarge (1981) had previously suggested to include pioneer therophyte-dominating associations of forest clearings in a new class with the provisional name *Galeopsio-Senecionietea sylvatici*, which included various described communities. According to Passarge's idea, in the same way initial *Sisymbrion* ruderal vegetations (now *Sisymbrietea* class) were distinguished from *Artemisietea* perennial communities they introduce, as well therophyte-rich vegetation, constituting an early dynamic step towards perennial communities in forest clearings, could have find a formal typification inside an autonomous class. Since the class was published as provisional, later de Foucault (2011) formally described *Galeopsio tetrahit-Senecionietea sylvatici*. Nowadays this class is only recognized by a minority part of researchers (https://www.e-veg.net/app/16206), whereas most of national synopsis do not consider it. Re-

Figure 4: Stand of *Clinopodio grandiflori-Galeopsietum pubescentis* in Val d'Assa (Asiago Plateau).
Slika 4: Sestoja asociacije *Clinopodio grandiflori-Galeopsietum pubescentis* v Val d'Assa (plato Asiago).

cent European classification system still considers it as not validly published and includes it in *Epilobietea angustifolii* (Mucina et al., 2016). Despite it appears incosistent to attribute communities formed by therophytes to a class including 'tall-herb perennial vegetation' (Mucina et al., 2016), we adapt to the predominant formulation and ascribe the *Clinopodio grandiflori-Galeopsietum pubescentis* to *Epilobietea*, awaiting for future clarifications on this issue. *Galeopsis pubescens*, *Myosotis sylvatica*, *Galeopsis tetrahit*, *Geranium robertianum*, *Senecio nemorensis/glabratus* and *Moehringia trinervia*, as differential, enable classification within the *Epilobietea* class.

The source of a second problem was the mixing of relevés independently from geological bedrock where surveys were performed. Vegetation plots on base-rich soils do not separate from those on acidic, poor soils. To overcome the possibility that the high *Galeopsis* cover can affect resemblance more than the small group of acidophilous species, our data from different geological matrices were separately treated, together with synthetic tables of some central European communities belonging to basophilous *Fragarion vescae* or acidophilous *Epilobion angustifolii* alliances. Resulting dendrograms show that both relevé groups independently join the group of communities attributed to *Fragarion* (Figure 5). The classification of the relevés to the same community, as hypothesised by Figure 3, was indirectly proved. The relevés were arranged in Table 1 according to their geological provenance to highlight floristic differences existing between the two substrates. Stands from acidic Lagorai exibit *Epilobion angustifolii* characteristic or differential species such as *Luzula luzuloides*, *Calamagrostis arundinacea*, *Senecio sylvaticus*.

Fragaria vesca and *Veronica chamaedrys* are the only frequently occurring *Fragarion* differential species; alliance character species are under-represented (*Atropa bella-donna*, *Stachys alpina*). Described communities with largely dominant *Galeopsis pubescens* are very limited in number in literature. *Galeopsio pubescentis-Impatientum parviflorae* was reported as fringe association in Central European *Fagus* wood, with *G. pubescens* cover increasing over the years (Passarge, 1997). It merges with other associations belonging to *Impatienti noli-tangere-Stachyion sylvaticae* (Figure 2a, 2b). The *Galeopsis pubescens* community from Lower Austria (Forstner, 1983) differs for the occurrence of many weed segetal and ruderal species revealing an anthropogenic, ruderal origin which points to the concept of *Galio-Urticetea* class. Finally, Passarge (1981) refers to a W-Carpathians subcontinental "*Galeopsis pubescens*-Rasse" of *Senecioni fuchsii-Galeopsietum tetrahit* within *Epilobion angustifolii*, without giving any material or other information. Original floristic and ecological features lead us to describe the new association *Clinopodio grandiflori-Galeopsietum pubescentis* with a largely dominating *Galeopsis pubescens* as differential species (holotypus rel. 9 in Table 1). *Clinopodium grandiflorum* assumes the role of dynamic link with the *Fagus* forest natural potential vegetation.

Synecology. The community develops under blowdown *Picea* or *Picea*-silver fir stands or patches, inside *Fagus*-silver fir-Norway spruce mixed woods, after logging, in soils where undecomposed or partially decomposed needles, twigs and cone scales have accumulated in the litter. It was detected in mountain belt, on basic to acidic geological substrata. Norway spruce contributes to lower the pH of topsoils naturally occurring on calcareous rocks, diminishing the differences between the soils originating from different matrices. The occurrence of acidocline species, such as *Agrostis capillaris*, *Veronica officinalis*, *Hypericum maculatum*, *Oxalis acetosella*, reveals poor-nutrient conditions. In the whole of coenosis reaction is at lowest level among the described *Fragarion* communities (Figure 6).

The initial lack of competition by perennial species, which colonize later the bare soil, ensures a luxuriant growth of annuals, in particular *Galeopsis pubescens*. In early colonizing phase, anemochorous species – *Epilobium montanum* above all – are frequent in the study area but negligible as far as coverage. The absolute absence of *Galeopsis* specimens in the herbaceous layer of relevés in neighbouring forests and their sporadic nature in the mantle stands in the study area (pers. unpublished data) is an indicator that seed banks locally play an important role in earlier forest regeneration process where a sterile litter prevails. In the Asiago Plateau, the *Galeopsis*-explosion in studied clearings at least partly might be subordinated to a previously agricultural-pastoral land use.

Syndynamic. The annual community represents the very initial stage of vegetation dynamics on partially-decomposed coniferous needle litter in the area of *Fagus* and mixed fir-beech forests: *Aremonio-Fagion* as regards communities on nutrient-rich substrates, *Luzulo-Fagion* in nutrient-poor ones. It has to be considered a community with an ephemeral life-history, capable to rapidly exploit mineral supplies which became available in the short period after disturbance. The occurrence of all differential species of *Atropetum* suggests to consider the *Clinopodio grandiflori-Galeopsietum pubescentis* as 'Vorstufe' (english translation: early stage) of *Atropetum bellae-donnae* itself, according to the interpretation that in Germany Oberdorfer (1993) gave in this sense to the described *Cirsium*-Gesellshaft. *Rubus idaeus*, here represented by *juvenile* specimens, is the major contributor to secondary seres; as a reliable alternative, in some cases it is possible that its overwhelming dominance can take over the short-lived dominance of *Galeopsis* species, to form the prevalent initial shrubby stage of the regeneration succession (pers. obs.).

Synchorology. In the mountain and high-mountain belts of the studied area, it was the most widespread community in the recolonization process within 2–3 years after windstorm. It was also observed outside the investigated areas in common ash forest clearings.

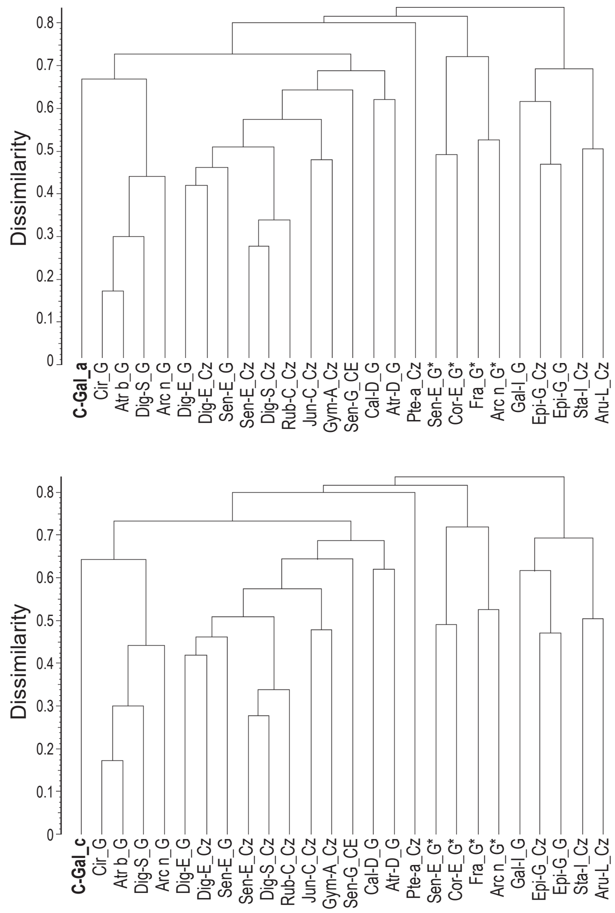

Figure 5: Classification of synthetic tables of *Clinopodio grandiflori-Galeopsietum pubescentis* and some European *Epilobietea angustifolii* vegetation units. Original data are separately analysed according to the different substrate type: acidic (**C-Gal_a**) or calcareous (**C-Gal_c**) soils. UPGMA-similarity ratio. For the other acronyms see Materials and methods.

Slika 5: Klasifikacija sintetskih tabel asociacije *Clinopodio grandiflori-Galeopsietum pubescentis* in nekaterih vegetacijskih tipov razreda *Epilobietea angustifolii* iz Evrope. UPGMA-koeficient podobnosti. Izvorni popisi so ločeno analizirani glede na različne podlage: kisla (**C-Gal_a**) ali karbonatna (**C-Gal_c**) tla. UPGMA-koeficient podobnosti. Za ostale okrajšave glej poglavje Material in metode.

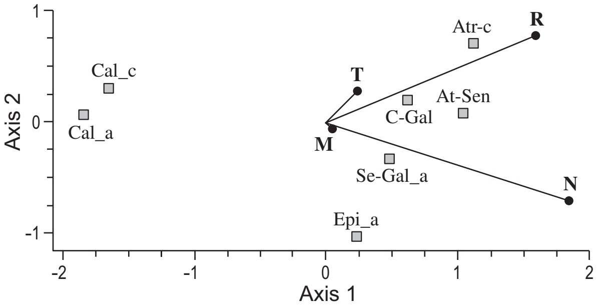

Figure 6: Ordination of main found communities according to weighted values of moisture (M), soil nitrogen (N), soil reaction (R) and temperature (T). C-Gal: *Clinopodio grandiflori-Galeopsietum pubescentis* (total relevés); At-Sen: *Athyrio filicis-feminae-Senecionetum glabrati* (total relevés). For the other acronims see Figure 3.

Slika 6: Ordinacija glavnih preučevanih združb in tehtane vrednosti indikatorjev za vlažnost (M), dušik v tleh (N), reakcijo tal (R) in temperaturo (T). C-Gal: *Clinopodio grandiflori-Galeopsietum pubescentis* (vsi popisi); At-Sen: *Athyrio filicis-feminae-Senecionetum glabrati* (vsi popisi). Za okrajšave glej Sliko 3.

Senecioni fuchsii-Galeopsietum tetrahit Passarge 1981 (cluster H in Table 2)

Differential species. *Galeopsis tetrahit* (dom. or subdom.), *Senecio sylvaticus*

Floristic composition. As the previous, also this annual cenosis appears prevalently as a pure *Galeopsis*-stand, but here *G. tetrahit* predominates (Figure 8). The occurring therophytes include also *Senecio sylvaticus*, *Moehringia trinervia* and *Galeopsis pubescens*. *Senecio sylvaticus* is a good differential, acidocline species of the coenosis, very rare in the studied territories – lacking from Veneto (Argenti et al., 2019) and very localised in the siliceous substrata of Lagorai Range in Trento province (Prosser et al., 2019) – the only one strictly depending on clearings due to catastrophic events or forestry practices, whereas the other elements also thrive in fringe communities or in the forest floor; the same is true in Central Europe (Passarge, 1981). Low-covering, frequent, perennial forbs include species related to regenerative processes post-disturbance (*Verbascum thapsus* subsp. *thapsus*, *Senecio nemorensis* subsp. *glabratus*, *Sambucus racemosa* juv., *Rubus idaeus* juv.), predisturbance forest understory species (*Hieracium murorum* agg., *Solidago virgaurea*, *Poa nemoralis*) and sward hemicryptophytes taking advantage of increased light availability (*Veronica officinalis*, *Ajuga pyramidalis*). The average species number per stand (19.3) is lower than association *Clinopodio grandiflori-Galeopsietum pubescentis*.

Syntaxonomy. The same difficulties encountered for the framing of *Clinopodio grandiflori-Galeopsietum pubescentis* also arise for this annual coenosis, given the formal declaration of *Epilobietea*, i.e. a class including perennial communities. The classification of Figure 7 shows the close similarity between *Senecioni fuchsii-Galeopsietum tetrahit* described by Passarge (1981) from Central Europe and our relevés with a high proportion of therophytes from high-mountain nutrient-poor bedrock of Lagorai chain. In the table of the original diagnosis Passarge (1981) reported '*Galeopsis tetrahit*, *bifida*' but in the text he explicitly mentioned *Galeopsis tetrahit* (pag. 281), thereby *Senecioni-Galeopsietum tetrahit* is validly published. It is confident to refer our *Galeopsis tetrahit*-rich vegetation type to the quoted association. The previously provided arguments about *Clinopodio-Galeopsietum pubescentis* apply in this case, therefore the association initially ascribed to *Galeopsio-Senecionetea sylvaticae* by Passarge (1981) belongs to *Epilobietea*. Unlike *Clinopodio-Galeopsietum pubescentis*, many differential and characteristic *Fragarion* species lack, namely *Fragaria vesca*, *Veronica chamaedrys*, *Atropa bella-donna*. Our original synthetic table clusters with most of the other selected coenoses belonging to *Epilobion angustifolii* (Figure 7), by virtue of the differential, high frequently occurring species *Luzula luzuloides*, *Calamagrostis arundinacea*, *Avenella flexuosa*. Many other acidocline species ingressive from *Nardetea* swards and rocky siliceous outcrops (*Atocion rupestre*) contribute to highlight the acidophilous feature of the coenosis.

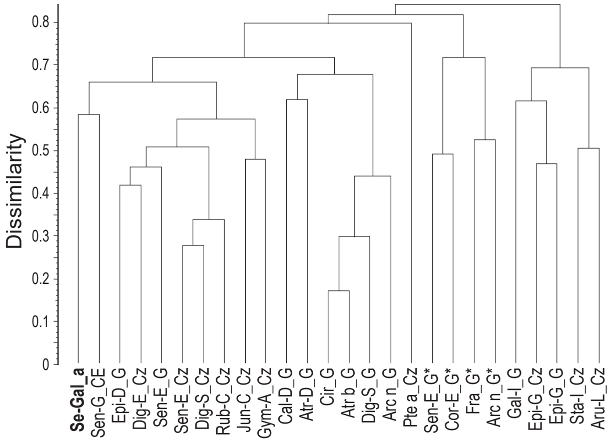

Figure 7: Classification of synthetic tables of original stands of *Senecioni-Galeopsietum tetrahit* (Se-Gal_a) and some European *Epilobietea angustifolii* vegetation units. UPGMA-similarity ratio. For the other acronyms see Materials and methods.

Slika 7: Klasifikacija sintetskih tabel izvornih sestojev asociacije *Senecioni-Galeopsietum tetrahit* (Se-Gal_a) in nekaterih vegetacijskih tipov razreda *Epilobietea angustifolii* iz Evrope. UPGMA-koeficient podobnosti. Za ostale okrajšave glej poglavje Material in metode.

Synecology. Also this coenosis develops in windthrow area clearings where spruce needles and twigs had accumulated in the *Oi* horizon of the soil, consisting of undecomposed organic material. *Galeopsis tetrahit* benefits of the absence of a previous forest understory and increased light availability. In nutrient-poor soils of Lagorai chain, *Galeopsis pubescens* is largely dominant in the mountaineous belt, *G. tetrahit* prevails in the subalpine one, where monospecific natural *Picea* forest occurs. Accordingly, *Senecioni-Galeopsietum tetrahit* grows at higher altitudes than *Clinopodio grandiflori-Galeopsietum pubescentis* (Figure 9).

Syndynamic. As *Clinopodio-Galeopsietum pubescentis* community in regards to *Fagion* s.l. woods, *Senecioni-Galeopsietum* represents the very early successional stage in the regeneration sere leading to *Picea* forest provisionally ascribed to *Luzulo nemorosae-Piceetum* by Pedrotti (2010). *Rubus idaeus*, here also represented by *juvenile* specimens, is the major shrub-like contributor to secondary seres following the pioneer *Galeopsis*-phase. In Czech Republic *Senecio sylvaticus* and *Galeopsis tetrahit* are interpreted, respectively, as representatives of xero-acidophilous and nitrophilous conditions prevailing in the very initial stage in the succession sere leading to *Senecioni-Epilobietum* (Petřík et al., 2009). In the same way, in the part of studied area falling within acidic substrata, the association can precede the *Epilobium angustifolium* community, but also the *Rubus idaeus* stage.

Synchorology. Initially described from Central Europe without any further more detailed scale information, the original data here reported seem to be the only ones since Passarge's work (1981).

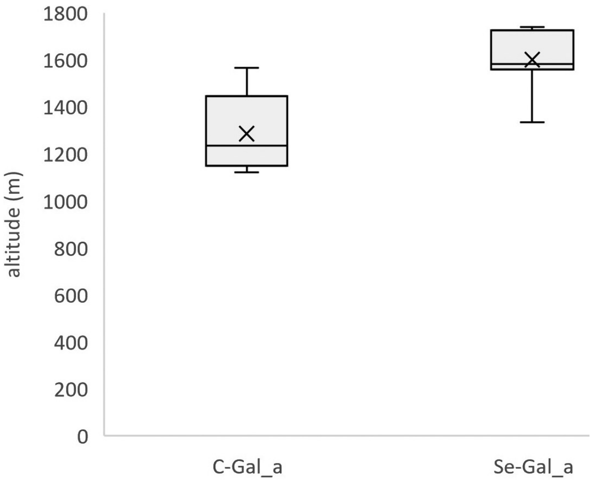

Figure 9: Box-plot of altitudinal occurrence of *Clinopodio grandiflori-Galeopsietum pubescentis* and *Senecioni-Galeopsietum tetrahit* on acidic bedrock.

Slika 9: Škatla z brki višin pojavljanja asocacij *Clinopodio grandiflori-Galeopsietum pubescentis* in *Senecioni-Galeopsietum tetrahit* na kisli matični podlagi.

Figure 8: Stand of *Senecioni-Galeopsietum tetrahit* in Val Campelle (Lagorai Range).
Slika 8: Sestoj asocacije *Senecioni-Galeopsietum tetrahit* v Val Campelle (gorska veriga Lagorai).

Impatiens glandulifera community (rel. 24 in Table 1)

The Asian neophyte *Impatiens glandulifera* is invasive in disturbed, nutrient-rich, mesic soils occurring in the Asiago Plateau. The species can occasionaly become largely dominant in the studied clearings and the relevé intends to demonstrate this eventuality. The alien is known to aggressively compete with indigenous plants in anthropogenic nitrophilous communities in wet and forest fringe habitat of central European plains where it constitutes the association *Calystegio-Impatientetum glanduliferae* (e.g. Láníková et al., 2009; https://www.e-veg.net/en/app/16236). Our relevé cannot be referred to the latter because of ecological and floristic differences.

Perennial herbaceous communities

A number of perennial herbaceous communities are widespread, whereas some other less common are represented through a single relevé. Our vegetation types from calcareous substrata join Central European communities included in basiphilous *Fragarion*, relevés from base-poor soils merge with communities which are attribuibuted to *Epilobion angustifolii* (Figure 10). Despite the previous analyses of original relevés might suggest a strong similarity between *Calamagrostis arundinacea*-rich stands on base-rich and base-poor soils, when they are compared with the selected European vegetation units evident differences emerge.

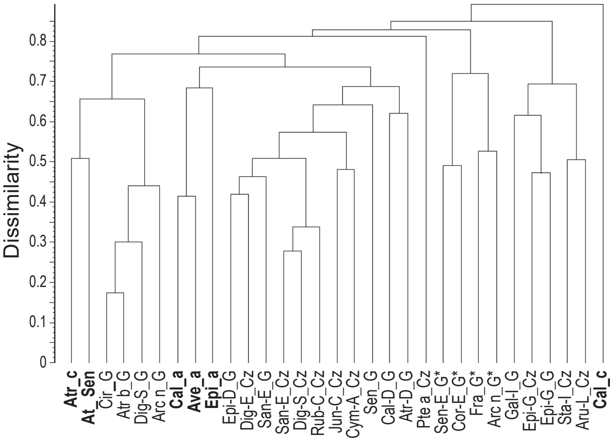

Figure 10: Classification of synthetic tables of original perennial herbaceous communities (in bold) and some European *Epilobietea angustifolii* vegetation units. UPGMA-similarity ratio. For the other acronyms see Materials and methods.
Slika 10: Klasifikacija sintetskih tabel izvornih trajnih zeliščnih združb (krepko) in nekaterih evropskih vegetacijskih tipov razreda *Epilobietea angustifolii*. UPGMA-koeficient podobnosti. Za ostale okrajšave glej poglavje Material in metode.

Atropetum bellae-donnae (Br.-Bl. 1930) Tx. 1950 (cluster C in Table 1)

Differential species. All the association characteristic species included in the Tüxen's (1950) original diagnosis occur: *Atropa bella-donna*, *Verbascum thapsus*, *Senecio nemorensis* agg. and *Stachys alpina*. In the investigated areas, *Atropa bella-donna*, *Verbascum thapsus* subsp. *thapsus*, *Cirsium arvense* and *Cirsium vulgare* act as differential species against the other established clearing communities.

Floristic composition. With its branching habitus reaching a height of 1.5–2 m, *Atropa bella-donna* also physiognomically charatcterises this two-layered community which shows a rich lower herbaceous layer where frequent species encompass: *Galeopsis pubescens*, *Fragaria vesca*, *Rubus idaeus* juv., *Agrostis capillaris* (V frequency class). *Cirsium* spp. and *Verbascum thapsus* also reaching important height contribute to connote this tall coenosis. Several *Carpino-Fagetea* species remaining from the previous undisturbed forest, short-lived perennial ruderal ingressive from *Artemisietea* and *Molinio-Arrhenatheretea* meadow plants, such as frequently occurring *Galium mollugo* agg., raise the mean species number per relevé which attains the value of 42.4.

Syntaxonomy. The high-frequency occurrence of *Atropa bella-donna*, *Verbascum thapsus*, *Fragaria vesca* and *Cirsium vulgare* (*Fragarion*), *Epilobium montanum* and *Geranium robertianum* (*Circaeo-Stachyetalia*) assure its strong framing in the base-rich syntaxonomic levels within *Epilobietea* class.

Synecology. The association is known to colonize basic, well-nitrified, humic and mesic soils under mild weather conditions (Oberdorfer, 1993; Mucina, 1993; https://www.e-veg.net/app/16476). It generally avoids open, extensive clearings determined by windstorm, prefering moderately shading areas. The occurrence of *Cirsium* spp. involves the off-site wind-dispersed species initial establishment post-disturbance. In the growing sites, uprooted coniferous stumps after the salvage logging exposed mineral soil pockets interspersed with remaining understory microplots and with parental material originating from the limestone bedrock. Mean ecological indicator value for reaction was the highest amongst all communities (Figure 6).

Syndynamic. *Atropetum* constitutes a fringe community and an initial phase of regenerative process in the area of potential mixed *Fagus-Abies alba* forests. It may follow the *Clinopodio grandiflori-Galeopsietum pubescentis* on base-rich soils.

Synchorology. The association is widespread throughout Europe: Central Europe (e.g. Aichinger, 1933; Tüxen, 1950; Mucina, 1993; Oberdorfer, 1993; https://www.e-veg.net/en/app/16476), Balkan (Ratknić et al. 2013) and Iberian Peninsula (Ninot et al., 2012), Italian mainland (Allegrezza, 2003). Despite its widely occurrence, original data shown here are the first documenting the presence of the association in Northern Italy.

Athyrio filicis-feminae-Senecionetum glabrati ass. nova hoc loco (cluster B in Table 1)

Differential species. *Senecio nemorensis* subsp. *glabratus* (dom.) or *Senecio cacaliaster* (dom.), *Deschampsia cespitosa* (loc.)

Floristic composition. Stands of association are three-layered. Upper level is physiognomically dominated by megaforb species *Senecio nemorensis* subsp. *glabratus* or *Senecio cacaliaster*, the former highly covering in the mountain belt whereas the latter prevailing at higher altitudes within the high mountain belt. The patches of bright, deep yellow flowers of *S. nemorensis /glabratus* are a clear indicator of the occurrence of the coenosis (Figure 11). In the southeastern prealpine investigated territories the *Senecio nemorensis* aggregatum is represented by *S. nemorensis /glabratus* replacing *Senecio ovatus* (syn. *S. fuchsii*) which lacks (Argenti et al., 2019; Prosser et al., 2019). In the middle stratum *Rubus idaeus* is particularly abundant, but also constantly occurring species include *Athyrium filix-foemina*, *Epilobium montanum*, *Agrostis capillaris*, *Urtica dioica* and, with a lesser degree, *Galium mollugo* s.l., *Deschampsia cespitosa*, *Dryopteris filix-mas* and *Myosotis sylvatica*. The ground layer hosts mainly *Fragaria vesca*, *Oxalis acetosella* and *Stellaria nemorum*. The recorded mean species number is slightly lower than in *Atropetum*: 35.1.

Biological and chorological spectra. Life forms (%). Hemicryptophytes 63.6, nanophanerophytes 23.3, geophytes 5.8, therophytes 4.1, phanerophytes 2.9, chamaephytes 0.3.

Chorological spectrum (%). Eurasiatic 36.9, Boreal 34.0, orophytes 22.9, Cosmopolitan 5.5, Mediterranean 0.7, alien 0.1, Atlantic 0.1, endemic 0

Syntaxonomy. Within the *Senecio nemorensis* aggregate the species *S. ovatus* is considered characterist or diagnostic species of the association *Digitali-Senecionetum ovati* spreading in Central Europe (e.g. Oberdorfer, 1993; Mucina, 1993; Petřík et al., 2009). In the study area, the occurrence of *S. nemorensis* subsp. *glabratus* in place of *S.*

Figure 11: Stand of *Athyrio filicis-feminae-Senecionetum glabrati* on slope of M. Badenecche (Asiago Plateau).

Slika 11: Sestoj asociacije *Athyrio filicis-feminae-Senecionetum glabrati* na pobočju M. Badenecche (plato Asiago).

ovatus do not permit to refere our relevés to the quoted association, despite evident common ecological features. At usually little higher altitude *Senecio cacaliaster* can locally replace *S. nemorensis /glabratus* in dominating the coenosis, as in Czech Republic *Senecio hercynicus* can do with *S. ovatus* (Petřík et al., 2009). In addition to *S. nemorensis /glabratus* and *S. cacaliaster*, *Galeopsis pubescens*, *Myosotis sylvatica*, *Petasites albus*, *Elymus caninus* and *Solanum dulcamara* also contribute to differentiate the southeastern pre-Alpine coenosis from *Digitali-Senecionetum*. Locally, *Deschampia cespitosa* act as differential species vs. the other found *Fragarion* communities. It is proposed the name *Athyrio filicis-feminae-Senecionetum glabrati* for the typification of the new association (holotypus rel. 14 in Table 1), where *Athyrium filix-femina* remarks the dynamic relationship with *Fagion* s.l. forest potential vegetation. Comparison with other synthetic tables shows a higher similarity with *Atropetum* coming from the same study area and with German communities belonging to *Fragarion*. They include *Senecionetum fuchsii* (= *Digitali-Senecionetum*) that Oberdorfer (1993) and Mucina (1993) put into *Sambuco-Salicion*, alliance encompassing elder, willow and hazel scrub communities within *Robinietea*. This interpretation does not take into consideration that *Digitali-Senecionetum ovati* is an herbaceous community, to the extent that Czech authors place it in acidic *Epilobion angustifolii* (Petřík et al., 2009) and Preising et al. (1993) inside base-rich *Fragarion*, anyway within *Epilobietea*. Despite Czech authors (Petřík et al., 2009) attribute the association to *Epilobion*, they argue that it also occurs on soils rich in nutrients. Eventually, the framing of *Athyrio-Senecionetum* into *Fragarion* alliance appears well-founded. The attribution to *Epilobietea* is assured by *Fragaria vesca*, *Stachys sylvatica* and *Veronica chamaedrys* (*Fragarion*), *Epilobium montanum* and *Geranium robertianum* (*Circaeo lutetianae-Stachyetalia sylvaticae*), *Senecio nemorensis* subsp. *glabratus*, *Galeopsis pubescens* and *Myosotis sylvatica* (*Epilobietea*).

Synecology. The community thrives in full sunlight clearings after salvage logging. After timber harvesting completion, forestry machineries leave behind soils with altered profiles and various coarse woody debris: limbs, not commercial trunk pieces, coniferae tops. Mineralization of organic matter releases large N amounts favourishing nitrophilous *Senecio nemorensis* agg. which rapidly takes advantage from these new site ecological conditions (Figure 6). The community is very frequent in early succession stages in forest clearings in the studied area on base-rich soils and on acidic substrata as well.

Syndynamic. The community colonizes clearings and margins of fir-beech forests, especially where prior nuclei or plantations of *Picea* were present. It is followed by the *Rubus idaeus* stage (*Rubetum idaei* according to personal relevés), as the great cover of young raspberry shoots clearly suggests.

Synchorology. The occurrence of *Athyrio-Senecionetum* is documented for the first time through our original relevés. It expands over wide areas affected by Vaia windthrow in southeastern pre-Alps. The complexity of the *Senecio nemorensis* aggregate and the very limited relevé material available do not yet allow to hypothesize the boundaries of its distribution range, also in relation to the occurrence of its similar (vicarious) vegetation unit *Digitali-Senecionetum*. If it is a fact that the latter is widespread across the Europe (e.g. Oberdorfer, 1993; Mucina, 1993; Petřík et al., 2009), it remains to establish its distribution within Italian territories, where data are quite poor. Its occurrence is proposed without documented material for Ortles-Cevedale Massif in Central Alps (Pedrotti, 2021), as ‘*Senecio fuchsii* community’ for Central Apennines on the basis of only one relevé (Allegrezza, 2003), as *Senecionetum fuchsii* through one relevé (Oberdorfer & Hofmann, 1967) and by means of a synthetic table (5 relevés) from Northern Apennines (Mercurio & Spampinato, 2001).

Epilobium angustifolium community (cluster I in Table 2)

Differential species. *Epilobium angustifolium* (dom.)

Floristic composition. In the vegetation patches *Epilobium angustifolium* increases in cover due to the rhizome vegetative propagation. In lower layer *Rubus idaeus*, as juveniles specimens, *Solidago virgaurea* and *Luzula nivea* are frequent companions.

Syntaxonomy. Three of the four relevés in cluster I of Table 2 were published by Venanzoni (1989) from Lagorai Range, where also our original stand was collected. The author refered them to *Senecioni sylvatici-Epilobietum angustifolii* on the basis of *Epilobium angustifolium* dominating occurrence, but taking up Oberdorfer’s suggestion (1993) he underlines its weakness as association characteristic species, just like *Senecio sylvaticus* which however lacks in the relevés. Indeed, *Senecioni-Epilobietum* is considered the central association of *Epilobion angustifolii* alliance (Oberdorfer, 1993; Dengler et al., 2007; Petrik et al., 2009), and only the large amount of acidophilous species such as *Carex pilulifera*, *Holcus mollis* and *Rumex acetosella* or also *Carex leporina*, *Carex pallescens* and *Calamagrostis epigejos*, as regards typified subassociations, contributes to distinguish it from other associations belonging to *Epilobion* (Oberdorfer, 1993). Since i) all these species practically lack in the stands, ii) *Senecio sylvaticus* is absent too, iii) *Epilobium angustifolium* attains high cover values in several communities on acidic as well on base-rich soils also in the study area, it appears more consistent to attribute these relevés to an ‘*Epilobium angustifolium* community’.

Synecology. The community develops on sunny exposed sites, on disturbed, granitic weathering soil with a coexistence of mineralized organic matter and high rate of rock fragments. It is the surveyed community with the highest nutrient soil content (Figure 6). Initial recruitment of *Epilobium angustifolium* is likely from off-side wind-dispersed seed, but subsequent increase in cover depends on vegetative propagation (Halpern, 1989).

Syndynamic. In the same way as the *Atropetum belladonnae* can be introduced by the *Galeopsis pubescens*-phase in the *Fagion* s.l. belt, at least in base-rich soils, tall forbs with prevailing *Epilobium angustifolium* can represent a slightly advanced dynamic stage in acidic soils of the subalpine area after *Galeopsis tetrahit* initial invasion.

Calamagrostis arundinacea communities (including *Avenella flexuosa* variant; clusters E-F-G in Table 3)

Differential species. *Calamagrostis arundinacea* (dom), *Avenella flexuosa* (dom; acidic substrata), *Vaccinium myrtillus* (subdom.)

Floristic composition. *Calamagrostis arundinacea* on base-rich and acidic soils and *Avenella flexuosa* only on acidic ones can form almost monospecific stands on deforested sites. Constant companions are *Vaccinium myrtillus* and young shoots of *Rubus idaeus*. On these undisturbed or moderately disturbed sites, predisturbance forest understory remains, giving some residual species the possibility to expand dramatically. Relevés on calcareous substrata maintain the wide range of nemoral species which accompanied *Fagus-Abies-Picea* forests before the windstorm, above all *Hieracium murorum*, *Luzula nivea*, *Polygonatum verticillatum*, *Rubus saxatilis*, *Rosa pendulina*. Acidic stands differ by the occurrence of the differential species of *Epilobion angustifolii* (*Avenella flexuosa*, *Luzula luzuloides*, *Epilobium angustifolium*) and, on the contrary, the lower rate of understory species belonging to the mesic deciduous woods (*Carpino-Fagetea*).

Syntaxonomy. *Calamagrostis arundinacea*-dominated clearings or natural forest-free areas were reported from many Central European territories (i.e. Oberdorfer, 1993; Mucina, 1993; Kliment & Jarolímek, 2003; Petrik et al., 2009). Communities belong to *Epilobietea* or *Mulgedio-Aconitetea* class of which *Calamagrostis arundinacea* is considered as characteristic species (Mucina et al., 2016). Our relevés dominated by *C. arundinacea* grouped together in the classification, but they separate according to the geological substrata of origin (Figure 3). Their respective synthetic tables split when put in comparison with selected Central European communities: stands from acidic soils join synthetic data included in *Epilobion angustifolii* and in particular show a strong similarity with *Avenella flexuosa*-rich relevés, whereas vegetation plots performed in base-rich soils form a well separated cluster (Figure 10). Despite an ecological affinity and a common dominating *C. arundinacea*, it is impossible to refer the relevés from acidic Lagorai chain to *Rubo idaei-*

Calamagrostietum arundinaceae (*Epilobion angustifolii*), as the differential species (with the exception of the widespread *Epilobium angustifolium* and the very common eponymous species) are almost entirely lacking. These stands may not either be ascribed to any association of the *Calamagrostion arundinaceae* alliance because of the different ecology and, consequently, the little significance of *Mulgedio-Aconitetea* class. Therefore, also *Digitali ambiguae-Calamagrostietum arundinaceae* sensu Sillinger reported from nearby Countries can be excluded on the basis of the evident floristic diversity resulting from the fact that it is a natural coenosis thriving in steep rocky slopes near the timberline (Kliment & Jarolímek, 2003). Despite *Digitali-Calamagrostietum* was also used to describe clearing relevés (e.g. Čarni & Hrovat, 2002), Kliment (1995) argumented on the opportunity to reserve the association name to natural subxerothermophilous stands. Our vegetation plots on base-rich soils differ for the high frequency rate of species belonging to the mesic deciduous forests (*Carpino-Fagetea*), with the occurrence, in particular, of characteristic species of Eastern beech and mixed fir-beech forests (*Aremonio-Fagion*): *Euphorbia carniolica*, *Aremonia agrimonoides*, *Cardamine trifolia*. Here herbs of *Vaccinio-Piceetea* are also common.

Epilobietea class is generally underrepresented and the absolute defect of *Artemisietea* species highlights the absence of heavy disturbance at soil level in these stands. Eventually, both relevé types on base-poor and base-rich soils result hard-to-place within the syntaxonomical scheme.

Synecology. *Calamagrostis arundinacea* is well known in silviculture because of its expansive growth, able to hamper the recruitment of forest species but also to protect disturbed areas against soil erosion, after selective cutting or in newly formed deforested sites within mixed forests. The community develops in undisturbed soil patches, where the canopy destruction involves higher light availability but the soil profile was not disrupted by tree uprooting. *Picea* snags and stumps created by harvesting without the use of forestry machineries left behind unaltered soil profile, permitting lower mineralization processes with respect to the other sampled communities (Figure 6). The values of the soil reaction attain low levels in comparison with the other communities, also in calcareous sites, maybe as consequence of the prolonged coniferous needle accumulation in the litter (Figure 6). The *Avenella flexuosa* variant replaces the expansive grass *Calamagrostis arundinacea* where more xeric and sunny conditions prevail in undisturbed acidic soils.

Syndynamic. The recruitment of the main tree species able to rebuilding the silver fir-beech and the Norway spruce forests following the forest blowdown appears possible without intermediate dynamic stages represented by *Rubus idaeus* or elder-willow scrubs (*Sambuco-Salicion*). Therefore, the *Calamagrostis arundinacea* community may be considered a slightly late step in basiphilous *Aremonio-Fagion* or acidophilous *Luzulo nemorosae-Piceetum* regeneration process.

Sambucus ebulus community (rel. 46 in Table 1) – *Eupatorium cannabinum* community (rel. 59 in Table 1)

Sambucus ebulus is a forest clearing or forest fringe species with an apophytic behaviour enabling it to colonize various anthropogenic ruderal habitats where this geophyte can be also more frequent. This tall herb rarely forms vegetation patches in the studied forest clearings so that we have been able to collect only one relevé on calcareous soil. The stand is paucispecific as the possible reference to the association *Sambucetum ebuli* (e.g. Mucina & Popma, 1982). Due to the extremely small sample size, we prefer to attribute the only vegetation-plot record at the *Sambucus ebulus* community rank.

For the same reason the *Eupatorium cannabinum*-rich stand was provisionally considered at the community level. *Eupatorietum cannabini* was described by Tüxen (1937) from northern Germany *Alnus glutinosus* forest clear cut, whereas Čarni & Hrovat (2001) reported it from Dinaric Karst in *Omphalodo-Fagetum* clearings. Our stand was collected from outer pre-Alpine range in Grappa Massif, within an *Ostryo-Fagetum* clearing as highlighted by *Ostrya* and other termophilous species such as *Clematis vitalba*, *Buphthalmum salicifolium*.

Syntaxonomic scheme

- *Epilobietea angustifolii* Tx. et Preising ex von Rochow 1951
  - *Galeopsio-Senecionetalia sylvatici* Passarge 1981
    - *Epilobion angustifolii* Oberd. 1957
      - *Senecioni sylvatici-Galeopsietum tetrahit* Passarge 1981
      - *Epilobium angustifolium* community
      - *Rumex acetosella* community (see Appendix 1)
  - *Circaeo lutetianae-Stachyetalia sylvaticae* Passarge 1967
    - *Fragarion vescae* Tx. ex von Rochow 1951
      - *Clinopodio grandiflori-Galeopsietum pubescentis* ass. nova hoc loco
      - *Atropetum bellae-donnae* (Br.-Bl. 1930) Tx. 1950
      - *Athyrio filicis-feminae-Senecionetum glabrati* ass. nova hoc loco
      - *Eupatorium cannabinum* community
      - *Impatiens glandulifera* community
      - *Sambucus ebulus* community
- *Incertae sedis*
  - *Calamagrostis arundinacea* communities (with *Avenella flexuosa* variant)

Other syntaxa quoted in the text

Anemono trifoliae-Abietetum Exner in Poldini et Bressan 2007
Arctietum nemorosi Tx. (1931) 1950
Arunco vulgaris-Lunarietum redivivae Sádlo et Petřík in Chytrý 2009
Atropo-Digitalietum luteae Oberd. 1957
Calamagrostio arundinaceae-Digitalietum grandiflorae (Sillinger 1933) Oberd. 1957
Calystegio sepium-Impatientetum glanduliferae Hilbig 1972
Corydalido claviculatae-Epilobietum angustifolii Hülbusch & Tx. 1968
Dentario pentaphylli-Fagetum Mayer et Hofmann 1969
Digitali ambiguae-Calamagrostietum arundinaceae Sillinger 1933
Digitali purpureae-Epilobietum angustifolii Schwickerath 1944
Digitali-Senecionetum ovati Pfeiffer 1936
Epilobio montani-Geranietum robertiani Lohmeyer ex Görs & Th. Müll. 1969
Galeopsio pubescentis-Impatientum parviflorae Passarge 1997
Galeopsio tetrahit-Galinsogetum parviflorae Poldini, Oriolo et Mazzolini 1998
Gymnocarpio dryopteridis-Athyrietum filicis-feminae Sádlo et Petřík in Chytrý 2009
Junco effusi-Calamagrostietum villosae Sýkora 1983
Luzulo albidae-Fagetum Meus. 1937
Luzulo nemorosae-Piceetum Br.-Bl. et Siss. 1939
Omphalodo-Fagetum (Tregubov 1957) Marinček et al. 1993
Ostryo-Fagetum M. Wraber ex Trinajstić 1972
Pteridietum aquilini Jouanne et Chouard 1929
Rubo idaei-Calamagrostietum Fajmonová 1986
Sambucetum ebuli Felföldy 1942
Senecionetum fuchsii (Kaiser 26) Pfeiffer 1936 em. Oberd. 1973
Senecioni-Epilobietum angustifolii Hueck 1931
Stachyo sylvaticae-Impatientetum noli-tangere Hilbig 1972

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References

AA. VV., (2020). Piano d'azione Vaia in Trentino. L'evento, gli interventi, i risultati. *Sherwood*, *248*, *suppl. 2*, 1–72.

Aichinger, E. (1933). *Vegetationskunde der Karawanken*. G. Fischer Verlag.

Allegrezza, M. (2003). Vegetazione e paesaggio vegetale della dorsale del Monte San Vicino (Appennino centrale). *Fitosociologia*, *40*(1), *suppl. 1*, 3–118.

Argenti, C., Masin, R., Pellegrini, B., Perazza, G., Prosser, F., Scortegagna, S., & Tasinazzo, S. (2019). *Flora del Veneto*. Cierre Edizioni.

Barbieri, G., & Grandesso, P. (2007). *Carta Geologica d'Italia alla scala 1:50.000 con note illustrative: Foglio 082 Asiago*. APAT, Regione Veneto. S.EL.CA.

Barkman, J.J., Doing, H., & Segal, S. (1964). Kritische Bemerkungen und Vorschlage zur quantitativen Vegetationsanalyse. *Acta Bot. Neerlandica*, *13*, 394–419. https://doi.org/10.1111/j.1438-8677.1964.tb00164.x

Bartolucci, F., Peruzzi, L., Galasso, G., Albano, A., Alessandrini, A., Ardenghi, N.M.G., Astuti, G., Bacchetta, G., Ballelli, S., Banfi, E., Barberis, G., Bernardo, L., Bouvet, D., Bovio, M., Cecchi, L., Di Pietro, R., Domina, G., Fascetti, S., Fenu, G., Festi, F., Foggi, B., Gallo, L., Gottschlich, G., Gubellini, L., Iamonico, D., Iberite, M., Jiménez-Mejías, P., Lattanzi, E., Marchetti, D., Martinetto, E., Masin, R.R., Medagli, P., Passalacqua, N.G., Peccenini, S., Pennesi, R., Pierini, B., Poldini, L., Prosser, F., Raimondo, F.M., Roma-Marzio, F., Rosati, L., Santangelo, A., Scoppola, A., Scortegagna, S., Selvaggi, A., Selvi, F., Soldano, A., Stinca, A., Wagensommer, R.P., Wilhalm, T., & Conti, F. (2018). An updated checklist of the vascular flora native to Italy. *Plant Biosystems – An International Journal Dealing with all Aspects of Plant Biology*, 152(2), 179-303. https://doi.org/10.1080/11263504.2017.1419996

Braun-Blanquet, J. (1964). *Pflanzensoziologie – Grundzüge der Vegetationskunde*. Springer Verlag.

Čarni, A., & Hrovat, T. (2001). Vegetacija gozdnih posek na dinarskem visokem krasu. *Hladnikia*, *12-13*, 57–65.

Čarni, A., & Hrovat, T. (2002). Vegetacija gozdnih posek na nekarbonatni podlagi na območju Ratitovca. *Hladnikia*, *14*, 5–11.

Chippindale, H.G., & Milton, W.E.J. (1934). On the viable seeds present in the soil beneath pastures. J. Ecol., 22(2), 508-531. http://www.jstor.org/stable/2256187

Chirici, G., Giannetti, F., Travaglini, D., Nocentini, S., Francini, S., D'Amico, G., Calvo, E., Fasolini, D., Broll, M., Maistrelli, F., Tonner, J., Pietrogiovanna, M., Oberlechner, K., Andriolo, A., Comino, R., Faidiga, A., Pasutto, I., Carraro, G., Zen, S., Contarin, F., Alfonsi, L., Wolynski, A., Zanin, M., Gagliano, C., Tonolli, S., Zoanetti, R., Tonetti, R., Cavalli, R., Lingua, E., Pirotti, F., Grigolato, S., Bellingeri, D., Zini, E., Gianelle, D., Dalponte, M., Pompei, E., Stefani, A., Motta, R., Morresi, D., Garbarino, M., Alberti, G., Valdevit, F., Tomelleri, E., Torresani, M., Tonon, G., Marchi, M., Corona, P., & Marchetti, M. (2019). Stima dei danni della tempesta "Vaia" alle foreste in Italia. *Forest@*, *16*, 3-9. http://doi.10.3832/efor3070-016

Dengler, J., Eisenberg, M., & Schröder, J. (2007). Die grundwasserfernen Saumgesellschaften

Nordostniedersachsens im europäischen Kontext – Teil II: Säume nährstoffreicher Standorte (*Artemisietea vulgaris*) und vergleichende Betrachtung der Saumgesellschaften insgesamt. *Tuexenia*, *27*, 91–136.

Dengler, J., Jansen, F., Chusova O., Hüllbusch H., Nobis M.P., Van Meerbeek, K., Axmanová, I., Bruun, H.H., Chytrý M., Guarino, R., Karrer, G., Moeys, K., Raus T., Steinbauer,M.J., Tichý, L., Tyler, T., Batsatsashvili, K., Bita-Nicolae, C., Didukh, Y., Diekmann, M., Englisch, T., Fernández-Pascual, E., Frank, D., Graf, U., Hájek, M., Jelaska, S.D., Jiménez-Alfaro, B., Julve, Ph., Nakhutsrishvili, G., Ozinga, W.A., Ruprecht, E.-K., Šilc, U., Theurillat, J.-P., & Gillet, F. (2023). Ecological Indicator Values for Europe (EIVE) 1.0. *Vegetation Classification and Survey*, *4*, 7–29. https://doi.org/10.3897/VCS.98324

Forstner, W. (1983). Ruderale Vegetation in Ost-Österreich. Teil 1. *Wiss. Mitt. Niederösterr. Landesmus. Wien*, *2*, 19-133.

Foucault, B. (de) (2011). Synthèse phytosociologique sur la végétation observée lors de la 146e session de la SBF dans les Ardennes. *Bull. Soc. Hist. Nat. Ardennes*, *101*, 33-50.

Foucault, B. (de), & Catteau, E. (2015). Contribution au prodrome des végétations de France : les *Epilobietea angustifolii* Tüxen & Preising in Tüxen 1950. *Journal de botanique de la Société botanique de France*, *70*, 1–26.

Galasso, G., Conti, F., Peruzzi, L., Ardenghi, N.M.G., Banfi, E., Celesti-Grapow, L., Albano, A., Alessandrini, A., Bacchetta, G., Ballelli, S., Bandini Mazzanti, M., Barberis, G., Bernardo, L., Blasi, C., Bouvet, D., Bovio, M., Cecchi, L., Del Guacchio, E., Domina, G., Fascetti, S., Gallo, L., Gubellini, L., Guiggi, A., Iamonico, D., Iberite, M., Jiménez-Mejías, P., Lattanzi, E., Marchetti, D., Martinetto, E., Masin, R.R., Medagli, P., Passalacqua, N.G., Peccenini, S., Pennesi, R., Pierini, B., Podda, L., Poldini, L., Prosser, F., Raimondo, F.M., Roma-Marzio, F., Rosati, L., Santangelo, A., Scoppola, A., Scortegagna, S., Selvaggi, A., Selvi, F., Soldano, A., Stinca, A., Wagensommer, R.P., Wilhalm, T., & Bartolucci, F. (2018). An updated checklist of the vascular flora alien to Italy. *Plant Biosystems - An International Journal Dealing with all Aspects of Plant Biology*. *152*(3), 556–572. https://doi.org/10.1080/11263504.2018.1441197

Gigante, D., Acosta, A.T.R., Agrillo, E., Attorre, F., Cambria, V.E., Casavecchia, S., Chiarucci, A., Del Vico, E., De Sanctis, M., Facioni, L., Geri, F., Guarino, R., Landi, S., Landucci, F., Lucarini, D., Panfili, E., Pesaresi, S., Prisco, I., Rosati, L., Spada, F., & Venanzoni, R. (2012). VegItaly: Technical features, crucial issues and some solutions. *Plant Sociology*, *49*(2), 71–79. https://doi.org/10.7338/pls2012492/05

Grime, J. Ph. (2001). *Plant strategies, vegetation processes, and ecosystem properties*. Wiley & Sons Ltd.

Grubb, P.J. (1977). The maintenance of species-richness in plant communities: the importance of the regeneration niche. *Biol. Rev.*, *52*, 107–145.

Halpern, C.B. (1989). Early successional patterns of forest species: interactions of life history traits and disturbance. *Ecology*, *70*(3), 704–720.

Harper, J.L. (1977). *Population biology of plants*. Academic Press.

Hintikka, V. (1987). Germination ecology of *Galeopsis bifida* (*Lamiaceae*) as a pioneer species in forest succession. *Silva Fennica*, *21*(3), 301–313.

Kleyer, M., Bekker, R.M., Knevel, I.C., Bakker, J.P, Thompson, K., Sonnenschein, M., Poschold, P., Van Groenendael, J.M., Klimes, L., Klimesová, J., Klotz, S., Rusch, G.M., Hermy, M., Adriaens, D., Boedeltje, G., Bossuyt, B., Dannemann, A., Endels, P., Götzenberger, L., Hodgson, J.G., Jackel, A-K., Kühn, I., Kunzmann, D., Ozinga, W.A., Römermann, C., Stadler, M., Schlegelmilch, J., Steendam, H.J., Tackenberg, O., Wilmann, B., Cornelissen, J.H.C., Eriksson, O., Garnier, E., & Peco, B. (2008). The LEDA Traitbase: A database of life-history traits of Northwest European flora. *J. Ecol.*, 96, 1266-1274. https://doi.org/10.1111/j.1365-2745.2008.01430.x (accessed 15/1/2023)

Kliment, J. (1995). *Digitali ambiguae-Calamagrostietum arundinaceae* Sill. 1933 - eine Hochgras- oder Schlagflur-Gesellschaft?. *Preslia*, *67*, 55–70.

Kliment, J., & Jarolímek, I. (2003). Syntaxonomical revision of the plant communities dominated by *Calamagrostis arundinacea* (alliance *Calamagrostion arundinaceae*) in Slovakia. *Thaiszia*, *13*, 135–158.

Láníková, D., Kočí, M., Sádlo, J., Šumberová, K., Hájková, P., Hájek, M., & Petřík, P. (2009). *Galio-Urticetea* Passarge ex Kopecký 1969. In: M. Chytry (Ed.), *Vegetace České republiky 2. Ruderální, plevelová, skalní a suťová vegetace* (pp. 289–378) [Vegetation of the Czech Republic 2. Ruderal, weed, rock and scree vegetation]. Nakladatelstvi Academia.

Lyndenmayer, D.B., & Noss, R.F. (2006). Salvage logging, ecosystem processes, and biodiversity conservation. *Conservation Biology, 20*(4), 949–958.

Marazzi, S. (2006). *Atlante orografico delle Alpi. SOIUSA*. Priuli & Verlucca editori.

Mercurio, R., & Spampinato, G. (2001). Dinamiche della vegetazione in tagli a buche nelle abetine del Parco Nazionale delle Foreste Casentinesi. *Informatore Botanico Italiano*, *33*(1), 215–218.

Mietto, P., & Sauro, U. (2000). *Grotte del Veneto. Paesaggi carsici e grotte del Veneto*. Regione Veneto, La Grafica ed.

Mucina, L. (1993). *Epilobietea angustifolii*. In: L. Mucina, G. Grabherr & T. Ellmauer (eds.), *Die Pflanzengesellschaften Österreichs. Teil 1. Anthropogene Vegetation* (pp. 252–270). Gustav Fisher Verlag.

Mucina, L., Bultmann, H., Diersen, K., Theurillat, J.-P., Raus, T., Čarni, A., Šumberova, K., Willner, W., Dengler, J. Garcia, R.G., Chytry, M., Hajek, M., Di Pietro, R., Iakushenko, D., Pallas, J., Daniels, F.J.A., Bergmeier, E., Santos Guerra, A., Ermakov, N., Valachovič, M., Schaminee, J.H.J., Lysenko, T., Didukh, Y.P., Pignatti, S., Rodwell, J.S., Capelo, J., Weber, H.E., Solomeshch, A., Dimopoulos, P., Aguiar, C., Hennekens, S.M., & Tichy, L. (2016). Vegetation of Europe: hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. *Appl Veg Sci*, *19*(suppl. 1), 3–264. https://doi.org/10.1111/avsc.12257

Mucina, L., & Popma, J. (1982). *Sambucetum ebuli* in the Netherlands. *Acta Bot. Neerl.*, *31*(1/2), 59–63.

Ninot, J.M., Font, X., Masalles, R.M., & Vigo, J. (2012). Syntaxonomic conspectus of the vegetation of Catalonia and Andorra. II: Ruderal communities. *Acta Bot. Barc.*, *53*, 113–189.

Oberdorfer, E. (1993). *Süddeutsche Pflanzengesellschaften, Teill II, Sand- und Trockenrasen, Heide- und Borgstgras-Gesellschaften, alpine Magerrasen, Saum- Gesellschaften, Schlag- und Hochstauden-Fluren*. Gustav Fisher Verlag.

Oberdorfer, E., & Hofmann, A. (1967). Beitrag zur Kenntnis der Vegetation des Nordapennin. *Beitr. naturk. Forsch. Südw.-Dtl.*, *26*(1), 83–139.

Passarge, H. (1981). Zur Gliederung mitteleuropäischer *Epilobietea angustifolii*. *Folia Geobot. Phytotax.*, *16*, 265–291.

Passarge, H. (1997). Veränderte Saumgesellschaften im märkischen *Fagion*-Areal. *Tuexenia*, *17*, 239–249.

Pedrotti, F. (2010). Le serie di vegetazione della regione Trentino-Alto Adige. In: C. Blasi (Ed.), *La vegetazione d'Italia* (pp. 83–110). Palombi & Partner s.r.l.

Pedrotti, F. (2021). Vegetation geoseries of the Ortles-Cevedale massif (central Alps, Italy)

and their phytogeographic significance. *Bocconea*, *29*, 245–261. https://doi.org/10.7320/Bocc29.245

Pellegrini, G.B., & Sauro, U. (1994). Lineamenti geomorfologici. In: AA.VV., *Storia dell'Altipiano dei Sette Comuni, vol. 1, Territorio e Istituzioni* (pp. 33–42). Neri Pozza Ed.

Petřík, P., Jiří Sádlo, J., & Zdenka Neuhäuslová, Z. (2009). *Epilobietea angustifolii* Tüxen et Preising ex von Rochow 1951. In: M. Chytry (Ed.), *Vegetace České republiky 2. Ruderální, plevelová, skalní a suťová vegetace* (pp. 379–405) [Vegetation of the Czech Republic 2. Ruderal, weed, rock and scree vegetation]. Nakladatelstvi Academia.

Pickett, S.T.A., Cadenasso, M.L., & Meiners, S.J. (2013). Vegetation Dynamics. In: E. Van der Maarel & J. Franklin (Eds.), *Vegetation Ecology*, 2nd edition (pp. 107–140). Wiley-Blackwell.

Pignatti, S. (2005). Valori di bioindicazione delle piante vascolari della flora d'Italia. *Braun-Blanquetia*, *39*, 3–97.

Podani, J. (2001). *Syn-Tax 2000. Computer program for data analysis in ecology and systematics. User's manual.* Scientia Publishing.

Poldini, L., Oriolo, G., & Mazzolini, G. (1998). The segetal vegetation of vineyards and crop fields in Friuli-Venezia Giulia (NE Italy). *Studia Geobotanica*, *16*, 5–32.

Preising, E., Vahle, H.C., Brandes, D., Hofmeister, H., Tüxen, J., & Weber, H.E. (1993). *Die Pflanzengesellschaften Niedersachsens – Bestandsentwicklung, Gefährdung und Schutzprobleme – Ruderale Staudenfluren und Saumgesellschaften*. Naturschutz Landschaftspflege Niedersachsen. Hannover

Prosser, F., Bertolli, A., Festi, F., & Perazza, G. (2019). *Flora del Trentino*. Edizioni Osiride.

Ratknić, M., Ratknić, T., Miletić, Z., Čokeša, V., Stajić, S., Braunović, S., & Ćirković-Mitrović, T. (2013). Changes of forest habitats destroyed by fire and the rate of natural revitalisation of damaged ecosystems. *Sustainable Forestry*, *67-68*, 117–132.

Rivas-Martínez, S., Rivas-Sáenz, S., & Penas, A. (2011). Worldwide Bioclimatic Classification System. *Global Geobotany*, *1*, 1–634. http://dx.doi.org/10.5616/gg110001

Šilc, U., & Čušin, B. (2005). *Galeopsido-Galinsogetum* Poldini & al. 1998 in NW Slovenia. *Thaiszia*, *15*, 63–83.

Sitzia, T., & Campagnaro, T. (2019). La tempesta "Vaia" nei boschi del Veneto: dei tipi forestali, di Natura 2000 e della pianificazione. Preprint pubblicato online il 6 febbraio 2019.

Slavíková, J. (1958). Einfluss der Buche (*Fagus silvatica* L.) als Edifikator auf die Entwicklung der Krautschicht in den Buchenphytozönosen. *Preslia*, *30*, 19–42.

Tasinazzo, S. (2023). Post-harvesting late summer-autumn weed vegetation in small size arable fields in Veneto: new insights into root crop communities in North East Italy. *Hacquetia*, *22*(1), 47–80. https://doi.org/10.2478/hacq-2022-0009

Theurillat, J.-P., Aeschimann, D., Küpfer Ph., & Spichiger, R. (1995). The higher vegetation units of the Alps. *Colloques Phytosogiologiques*, *23*, 189–239.

Tomasi, G. (2019). Inquadramento territoriale. In: F. Prosser, A. Bertolli, F. Festi & G. Perazza, *Flora del Trentino* (pp. 17–26). Edizioni Osiride.

Tuxen, R. (1937). Die Pflanzengesellschaften Nordwestdeutschlands. *Mitt. Flor.-soz. Arbeitsgem*, *3*, 3–170.

Tüxen, R. (1950). Grundriß einer Systematik der nitrophilen Unkrautgesellschaften in der Eurosibirischen Region Europas. *Mitt. Florist.-Soziol. Arbeitsgem. N.F.*, *2*, 94–175.

Ulanova, N.G. (2000). The effects of windthrow on forests at different spatial scales: a review. *Forest Ecology and Management*, *135*, 155–167.

Van der Maarel, E. (1996). Vegetation dynamics and dynamic vegetation science. *Acta Bot. Neerl.*, *45(4)*, 421–442.

Venanzoni, R. (1989). La vegetazione di alcune radure formatesi in seguito a schianti provocati dal vento in Valsugana (Trentino). *Inf. Bot. Ital.*, *21*(1-3), 123–130.

Verheyen, K., Guntenspergen, G.R., Biesbrouck, B., & Hermy, M. (2003). An integrated analysis of the effects of past land use on forest herb colonization at the landscape scale. *J. Ecol.*, *91*, 731–742.

Appendix 1

During the peer-review evaluation process, another acidophilic community with largely dominant *Rumex acetosella* was discovered along the Col Visentin Ridge in the easternmost Venetian pre-Alps. Two relevés were gathered in clearings within a potential *Fagus* forest after the logging following the *Picea* nuclei blowdown. Calcareous strata with flint come to surface in the area. The two relevés are given in Table 4. The classification analysis (not reported) of the resulting synthetic table and those coming from the '*Rumex acetosella*-Fluren' in Passarge (1981) resulted in the impossibility to recognize any of the described coenoses. Pending the collection of further data, the original relevés are treated at community level.

Table 1: Relevés of the alliance *Fragarion vescae* in windstorm ‘Vaia’ forest clearings from SE Italian pre-Alps.
Tabela 1: Fitocenološki popisi zveze *Fragarion vescae* na gozdnih čistinah, nastalih po vetrolomu ‘Vaia’ v JV italijanskih Predalpah.

relevé number	1	8	16	27	2	12	5	47	28	9	3	7	21	25	58	36	32	42	31	6	22	48	14	26	52	57	10	11	13	23	49	60	62	61						24	59	46
locality	Puntara del Lom	Spiazzo Garibaldi	M. Sbarbatal	C.ra Tombal	Puntara del Lom	M.Badenecche	M. Brustolac	C.ra Tombal	C.ra Tombal	V. d'Assa	V. Campomulo	M. Brustolac	M.ga Buson	M.ga Erch	V. Calamento	M. Panarotta	V. Campelle	Pra Serà	V. Campelle	M. Brustolac	Marcesina	C.ra Col del Lupo	M.Badenecche	C.ra Tombal	V. d'Assa	V. Calamento	Po. del Giamolo	V. d'Assa	M.ga Fratte	M.ga Erch	C. di Remi	Baitle	M. Tormeno	M. Tormeno						M.ga Erch	Campo Solagna	M.ga Erch
coordinate N	45° 54.928’	45° 53.130’	45° 56.388’	45° 56.868’	45° 55.117’	45° 54.702’	45° 56.919’	45° 56.658’	45° 56.758’	45° 55.621’	45° 54.846’	45° 56.806’	45° 58.227’	45° 56.059’	46° 144912	46° 02.523’	46° 08.045’	46° 05.375’	46° 07.872’	45° 56.840’	45° 57.460’	45° 57.738’	45° 54.847’	45° 56.865’	45° 56.776’	46° 09.007’	45° 55.115’	45° 55.839’	45° 55.258’	45° 55.958’	45° 50.542’	45° 57.429’	45° 51.328’	45° 51.083’						45° 56.054’	45° 50.745’	45° 56.015’
coordinate E	11°31.440’	11°24.416’	11°34.959’	11°40.682’	11°31.527’	11°39.008’	11°37.423’	11°40.695’	11°40.938’	11°26.932’	11°34.010’	11°37.301’	11°34.530’	11°41.045’	11°464241	11°19.489’	11°30.141’	11°35.542’	11°30.050’	11°37.532’	11°34.868’	11°38.684’	11°38.196’	11°40.682’	11°24.427’	11°27.234’	11°27.302’	11°26.802’	11°38.619’	11°41.001’	11°38.124’	11°25.149’	11°18.311’	11°18.752’						11°41.183’	11°45.106’	11°41.242’
date	3/8/20	12/8/20	19/8/20	15/9/20	3/8/20	19/8/20	7/8/20	5/8/21	15/9/20	12/8/20	3/8/20	7/8/20	5/9/20	12/9/20	20/8/21	29/7/21	26/9/20	2/8/21	26/9/20	7/8/20	5/9/20	5/8/21	19/8/20	15/9/20	11/8/21	20/8/21	12/8/20	12/8/20	19/8/20	12/9/20	5/8/21	20/9/21	24/9/21	24/9/21						12/9/20	12/9/21	5/8/21
elevation (m)	1395	1500	1480	1295	1430	1180	1360	1280	1250	1120	1410	1340	1440	1195	1325	1565	1180	1235	1120	1405	1460	1480	1375	1300	1270	1380	1080	1140	1365	1130	1210	1490	1125	1250						1160	940	1130
aspect	ESE	E	S	NE	E	E	WSW	ENE	E	ENE	ENE	W	ESE	S	SSW	SE	WSW	SE	W	W	E	WNW	SE	NE	ESE	SSW	SW	SW	SSE	SSW	W	SE	E	W						SE	SSE	SE
slope (°)	1	17	10	17	25	30	22	12	19	23	25	8	16	27	31	38	25	23	40	20	6	15	10	18	14	24	20	18	27	28	12	22	26	29						15	38	20
relevé area (m2)	60	25	30	25	40	80	100	100	100	100	20	30	25	50	20	25	40	80	40	100	40	60	80	50	40	50	100	100	100	40	40	30	40	30						50	25	25
herb layer (c) cover (%)	90	90	90	70	80	100	90	90	100	100	90	70	60	90	75	75	75	90	70	100	90	95	100	100	95	90	80	70	60	95	100	80	80	80						100	75	100
lower shrub layer (B2) cover (%)	-	-	-	-	-	10	-	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	<5	-	-	15	-	<5	-	15	<5	5	-	5	-						<5	-	-
species number	43	26	38	18	37	44	23	25	23	37	34	18	26	15	34	10	34	16	34	33	22	20	29	54	39	49	53	64	59	46	32	34	33	18						43	40	6
cluster in Figure 3	A																			B							C													D1		D2
mountain area	AP	AP	AP	AP	AP	AP	AP	AP	AP	AP	AP	AP	AP	AP	LR	LR	LR	LR	LR	AP	AP	AP	AP	AP	AP	LR	AP	AP	AP	AP	AP	AP	TP	TP						AP	GM	AP
	calcareous bedrock (cb)														acidic bedrock (ab)																				Ass1 cb	Ass1 ab	Ass1	Ass2	Ass3	C1	C2	C3
Ass1 *Clinopodio grandiflori-Galeopsietum pubescentis*																																										
Galeopsis pubescens (Cl)	4	4	4	4	4	4	5	5	5	5	4	3	3	4	4	4	4	5	3	1			2b	2a	1	+	2b	1	2a	2b	+	1	2b		100^{3-5}	100^{3-5}	100^{3-5}	71^{+-2b}	88^{+-2b}	1	+	+
Ass2 *Digitali-Senecionetum ovati*																																										
Senecio nemorensis/glabratus (Cl)				+				r						+	+	1	+		+	2a		2b	4	4	4	3	+	2a		+	+		1	1	21	80	37	86	75	+	+	
Senecio cacaliaster			1		+		+			+	2a	+		+						4	3	3	+	1	1	+		+	+						50		37	100	25			
Deschampsia cespitosa	+										+									+	+	1	1	+		+	+	+							14		11	86	25			

relevé number	1	8	16	27	2	12	5	47	28	9	3	7	21	25	58	36	32	42	31	6	22	48	14	26	52	57	10	11	13	23	49	60	62	61						24	59	46
Ass3 *Atropetum bellae-donnae*																																										
Cirsium arvense						+		+	+					r							r			+		+	+	2a	2b	3	2b	2b		1	29		21	43	88	+		
Verbascum thapsus/thapsus (All1)		1				+							1		+											+	1	1	1	2b		+	+	+	21	20	21	14	88		+	
Atropa bella-donna (All1)						+		+																			1	2a		2a	3	3	3	3	14		11		88			
Cirsium vulgare (All1)						+		+							r													1	+			2a	+	+	14	20	16		63		+	
C1 *Impatiens glandulifera* community																																										
Impatiens glandulifera (Cl)	r					+																													14		11			5		
C2 *Eupatorium cannabinum* community																																										
Eupatorium cannabinum (All1)																	+										1	+		+	+					20	5		50	+	3	
C3 *Sambucus ebulus* community																																										
Sambucus ebulus (All1)								+	2a															+						1					14		11	14	13	+		5
char, diff sp *Fragarion vescae* (All1)																																										
Fragaria vesca	+	+	1	+	+	1	+	1		+	+	+	1		+		+	+	+	1	+	+	2a	2a	1	2b	1	1	1	2a	1	2a		2a	86	80	84	100	88	2a	1	
Veronica chamaedrys		+	+	+	+	+			+			+	+		+			r					+	+	+	+	+	+	1	+	+		1		57	40	53	57	75			
Stachys sylvatica															+		+					+		+	1	+		+			+					40	11	57	25			
Viola reichenbachiana						+							1				+		+					+					+	+		+	+		14	40	21	14	50	+		
Poa nemoralis					+													+	+	r							+		+			+	+		7	40	16	14	50			
Hypericum perforatum						+		+					+					+							+			+					+	+	21	20	21	14	38		r	
Ajuga reptans																				+							1				+	+	+					14	50			
Cirsium oleraceum	+									+															+		2a	+							14		11	14	25			
Stachys alpina		+			+																					+	1						1		14		11	14	25			
Verbascum lychnitis						+																					+	+		+					7		5		38		+	
Milium effusum																										+					1							14	13			
Digitalis lutea																											2b						+						25			
Bromopsis benekenii						+																									+				7		5		13			
Verbascum nigrum		+																																	7		5					
Angelica sylvestris																			+																	20	5					
char, diff sp *Circaeo lutetianae-Stachyetalia sylvaticae*																																										
Epilobium montanum	+	1	+	1	+	+	+	+		1	1		1	+	+		+		+	+	+	+	+	1	1	1	+	1	+	+	+	+			86	60	79	100	75			
Geranium robertianum				1	+			r		1					+		+		+				+	+	+		1	+	1		+	+	2a		29	60	37	43	75		1	
Mycelis muralis				+	r	+	+	r		+	+	+	1		+				+				+	+		+	+	1	1	+					64	40	58	43	50	+	+	
Scrophularia nodosa		1				+				+					+		+	1									2a		2a		+		+		21	60	32		50		1	
Carex sylvatica			1																							+			+				+		7		5	14	25			
Cardamine flexuosa							+													+			+												7		5	29				
Lapsana communis					+														+														+		7	20	11		13		+	
Aegopodium podagraria						+																											+		7		5		13			

relevé number	1	8	16	27	2	12	5	47	28	9	3	7	21	25	58	36	32	42	31	6	22	48	14	26	52	57	10	11	13	23	49	60	62	61						24	59	46
char, diff sp *Epilobion angustifolii*																																										
Calamagrostis arundinacea					+										+	+	+		+						+	1						+			7	80	26	29	13			
Luzula luzuloides															+	+	+	r	+							+										100	26	14				
Avenella flexuosa																+										+										20	5	14				
Atocion rupestre															+			1	+																	60	16					
Vaccinium myrtillus		+					+					+																							21		16					
Senecio sylvaticus															+																					20	5					
Calluna vulgaris																		r																		20	5					
char, diff sp *Epilobietea angustifolii* (Cl)																																										
Myosotis sylvatica	1	+	1	+	2a				1	2a	+				1				+	1	+		+		+	+		+			+		2a		57	40	53	71	38			
Petasites albus	+				1					+	2b			1			+		+	2b		1	+		2a			2a				+			36	40	37	57	25	+		
Galeopsis tetrahit	2a							+		+		2a			2a			+			+		+			1	+	1	2a						29	40	32	43	38			
Moehringia trinervia	+	+	+	1	1					+	+		1		1	+	2a		+										+			+	+		57	80	63		38			
Silene dioica			+						+	+					+		2a		+								+	+				+	1		21	60	32		50		+	
Galeopsis speciosa							+						+		+											+			+						14	20	16	14	13			
Gnaphalium sylvaticum																	+							+					r							20	5	14	13			
Chaerophyllum aureum	+				+						+																	+							21		16		13			
Verbascum alpinum																			+										1							20	5		13			
Epilobium angustifolium																								+														14				
Galium aparine																+																				20	5					
Barbarea bracteosa									1																										7		5					
Epilobium hirsutum													r																						7		5					
Impatiens noli-tangere																			2a																	20	5					
Alliaria petiolata																																									+	
Fallopia dumetorum																																									+	
char sp *Artemisietea vulgaris*																																										
Tussilago farfara	+		+																	+			+		+		+	1		+		+			14		11	43	50	+		
Senecio inaequidens									+				+											+					+		+			3	14		11	14	38			
Cirsium eriophorum									+															r			+			+					7		5	14	25			
Verbascum thapsus/montanus																											+	+				+							38			
Erigeron annuus						+																						+	+						7		5		25			
Arctium minus																														+	+								25			
Arctium lappa																												+											13			
Poa compressa																														+									13			
Elymus repens	1				+																														14		11					
Silene latifolia																																									+	

relevé number	1	8	16	27	2	12	5	47	28	9	3	7	21	25	58	36	32	42	31	6	22	48	14	26	52	57	10	11	13	23	49	60	62	61						24	59	46
char sp *Mulgedio-Aconitetea*																																										
Chaerophyllum hirsutum															+				+						2a	+										40	11	29				
Myrrhis odorata				+																		+		+											7		5	29				
Carduus personata																									1		+											14	13			
Cirsium erisithales					+						+																					+			14		11		13		1	
Geum rivale			+																												+				7		5		13			
Betonica alopecurus																								+														14				
Geranium sylvaticum																					+																	14				
Rumex arifolius																								+														14				
Aconitum lycoctonum agg																													+										13			
Telekia speciosa																												+											13			
char sp *Robinietea*																																										
Rubus idaeus juv.	+	2a	1	+	+	+	1	2a	+	1	2b	2b	1	1	1	1	1	+	1	4	4	3	3	2a	+	2b	+	+	1	1	2b	+		+	100	100	100	100	88	2a	1	
Sambucus nigra (B2+c)		+				2a				+		+	2b	r			+										1	+	2b		1		+	r	43	20	37		75			
Sambucus racemosa (B2+c)								1	+						+	1	+		+					+		+						1			14	80	32	29	13			
Salix caprea (c)			+					+								r	+									+	+		+			+			14	40	21	14	38	+		+
char sp *Carpino-Fagetea*																																										
Dryopteris filix-mas		+		+	+	+	+			+	+			+			+	+	+	+		1	+	+	+		+		+	r			+		57	60	58	71	50	+	+	
Athyrium filix-femina		+	+		+					+				+	+		+		+	+	2b	1	1	+	+	r							+		36	60	42	100	13			
Hieracium murorum p.max.p.	+		+				+			+	1	+	+		+		+									1		+	+			+			50	40	47	14	38			
Luzula nivea		1					+				+		1		+											1	2b		+			+	+		29	20	26	14	50	+		
Cardamine impatiens	+	+			2a		+			1	1				+								+				+	+				+			43	20	37	14	38			
Carex digitata								+					2a				+			+								+		+	+	+			14	20	16	14	50		+	
Lamium galeobdolon		+								+	+		+		+		+				+				+		+								29	40	32	29	13			
Carex alba										+																	+	+		+		2a		2b	7		5		63			
Dryopteris dilatata							+			+										+	2a	+	1												14		11	57				
Stellaria nemorum/nemorum															1				+	+			1		+								+			40	11	43	13			
Fagus sylvatica (pl)						+																		+			+			1			1		7		5	14	38			
Aremonia agrimonoides			+							+	+									r				+				+							21		16	29	13			
Cyclamen purpurascens		r				r				+																	1		1					r	21		16		38			
Gymnocarpium dryopteris															+		+				1		+				+									40	11	29	13			
Polygonatum verticillatum			+		+					r											+								+						21		16	14	13			
Lonicera xylosteum (B2+c)						+								+											+					+					14		11	14	13	+		
Sanicula europaea				+																+				r											7		5	29		r		
Viola riviniana															+											+		+								20	5	14	13			
Helleborus viridis											+																		+	+					7		5		25	r		
Cardamine trifolia			+		1						1										2b														21		16	14				

relevé number	1	8	16	27	2	12	5	47	28	9	3	7	21	25	58	36	32	42	31	6	22	48	14	26	52	57	10	11	13	23	49	60	62	61						24	59	46
Daphne mezereum																									+			+										14	13	+	+	
Prenanthes purpurea																										r						+						14	13	+		
Campanula trachelium																											1	+											25			
Aposeris foetida	+												+								+														14		11	14				
Clinopodium grandiflorum					r					+							+		+																14	40	21					
Actaea spicata										+																			r						7		5		13			
Hedera helix						+																							+						7		5		13		+	
Epipactis helleborine						r				+			+																						21		16					
Luzula pilosa																				+																		14				
Prunus avium (c)																								+														14				
Ranunculus nemorosus																										+												14				
Brachypodium sylvaticum																																+							13		1	
Laburnum alpinum (pl)																													r										13			
Salvia glutinosa																																		+					13	1	3	+
Galium odoratum		1			r																														14		11					
Paris quadrifolia											+																								7		5					
Phegopteris connectilis																			+																	20	5					
Anemonoides trifolia			+																																7		5					
Polystichum aculeatum					+																														7		5				+	
Adoxa moschatellina										+																									7		5					
Lamium orvala		+																																	7		5					
Mercurialis perennis										+																									7		5					
Asarum europaeum																																								+		
Knautia drymeia																																								+		
Pulmonaria officinalis																																								+		
char sp *Vaccinio-Piceetea*																																										
Oxalis acetosella		+		+		+	r			1	+	1	+				1		1	r	+			+	+						+		+		57	40	53	57	25	+		
Lonicera nigra (B2+c)						+				1														+	2b		+	+							14		11	29	25			
Picea abies (pl+c)																		+				+	+													20	5	29				
Luzula sylvatica/sieberi																					+									r								14	13			
Circaea alpina										1					+											+									7	20	11	14				
Veronica urticifolia											+						+		+																7	40	16					
Homogyne alpina																										+												14				
Larix decidua (c)																										+												14				
Maianthemum bifolium			+		+																														14		11					
Melampyrum sylvaticum							r																												7		5					
Orthilia secunda						+																													7		5					

relevé number	1	8	16	27	2	12	5	47	28	9	3	7	21	25	58	36	32	42	31	6	22	48	14	26	52	57	10	11	13	23	49	60	62	61						24	59	46
char sp *Molinio-Arrhenatheretea*																																										
Galium mollugo agg	+		1	+	+	+	+		+		+		+							1		+	+	+	+	+	+	+	+	1	1	1			64		47	86	75		+	
Trifolium pratense	r								+														+	+				+	+	r					14		11	29	38			
Lathyrus pratensis	+		+																								+	+	+		r				14		11		50			
Vicia sepium	+				+																						+			+			+		14		11		38	+		
Trisetaria flavescens																						+			r	r												43				
Schedonorus pratensis																								+				+			+							14	25			
Stellaria graminea			+									+												+	r										14		11	29				
Poa pratensis								+																		+			+						7		5	14	13			
Trifolium repens																									+			+										14	13			
Leucanthemum vulgare agg																												+	r										25			
Cerastium holosteoides	+																		+									+							7	20	11		13			
Poa trivialis	1		+																												+				14		11		13	+		
Ranunculus acris	r								1																				r						14		11		13			
Vicia cracca					+																				+										7		5	14				
Phleum pratense	r																														+				7		5		13	+		
Agrostis stolonifera																					+																	14				
Bistorta officinalis																								+														14				
Carex spicata																									r													14				
Prunella vulgaris																									+													14				
Lotus corniculatus																												+											13			
Cynosurus cristatus																															r								13			
Epilobium tetragonum/tetragonum																													+										13			
Centaurea nigrescens/transalpina	+		+																																14		11			r		
Poa supina																	r																			20	5					
Viola tricolor/saxatilis									1																										7		5					
Anthriscus sylvestris	+																																		7		5					
Carex hirta	1																																		7		5					
Carum carvi	+																																		7		5					
Mentha longifolia	+																																		7		5					
char sp *Nardetea strictae*																																										
Agrostis capillaris	+		+		+		+	+			+	+						+		1	+	+	+	2a	+	2a		+	+	+	+	+		r	50	20	42	100	75	+		
Veronica officinalis	+	+					+	+					1	+			+	+						+		1	+	2b	1	1		2a			43	40	42	29	63	+		
Hypericum maculatum	1	+	1		1							+								1	+	1	+					+							36		26	57	13			
Potentilla erecta								+				+						+								+									14	20	16	14				
Carex leporina																										+												14				
char sp *Festuco-Brometea*																																										
Brachypodium rupestre			+					+																+			+	2b		+					14		11	14	38	+		
Euphorbia cyparissias			+			+			+					+										+					+	+					29		21	14	25	+		

relevé number	1	8	16	27	2	12	5	47	28	9	3	7	21	25	58	36	32	42	31	6	22	48	14	26	52	57	10	11	13	23	49	60	62	61						24	59	46
Medicago lupulina	+					r			+																			+	+	+					21		16		38			
Arabis hirsuta																											+			r									25			
char sp *Trifolio-Geranietea*																																										
Carex pairae		+				+																					1	+	1						14		11		38	+		
Cruciata glabra						+																		+		+				+					7		5	29	13	+		
Clinopodium vulgare																												+											13			
Inula conyzae																														+									13			
Trifolium aureum																																	+						13			
Buphthalmum salicifolium																																									+	
other																																										
Urtica dioica	1	+	1	+	1			+	+	1	+		1		+		+		1	1	+	1	1	+	1	+	1	+	+		2b	1	+		71	60	68	100	75	+	+	1
Solanum dulcamara					+	2b		1	r	+		r					+		2a				1	+		+	1	+	1	1	1		+		43	40	42	43	75		1	
Solidago virgaurea				+		+									1				+	+				+		+	+					1			14	40	21	43	25	2a	+	
Dactylis glomerata s.l.	+		+	+				+			+											+		+		+				+					36		26	43	13	+		
Taraxacum sect. Ruderalia	+					r					r													+			r	+	+	+					21		16	14	50			
Sorbus aucuparia (B2+c)			+					+														+		+	+	1		+							14		11	57	13	+		
Elymus caninus	+				+	r					+									1			+		+			+							29		21	43	13		+	
Festuca rubra agg	+		+				+				+									+				1		+									29		21	43				
Rubus ser. *Glandulosi juv.*														4			+		+					+						+	+				7	40	16	14	25	3		2a
Adenostyles alpina	+									+	+									+							+					+			21		16	14	25			
Calamagrostis varia																				+							1	+						+				14	38	+		
Achillea millefolium agg	+																			+				+					+						7		5	29	13			
Acer pseudoplatanus (pl)									r															+					r				+		7		5	14	25			
Alchemilla vulgaris agg			+						+			+												+	+										21		16	29				
Sonchus oleraceus													+															+	r						7		5		25			
Geranium phaeum																								+	1													29				
Carduus defloratus s.l.																									+									+				14	13			
Carlina acaulis																										r			+									14	13			
Valeriana officinalis agg																								+				+										14	13			
Valeriana tripteris																				+									r									14	13			
Erigeron canadensis																													+	+									25		r	
Arenaria serpyllifolia																											+			+									25			
Erigeron sumatrensis						+								r																+					14		11		13			
Gymnocarpium robertianum					+						+																+								14		11		13			
Petasites paradoxus					+																									+					7		5		13			
Polygonum aviculare									+																				+						7		5		13			
Anthoxanthum odoratum																										+												14				
Heracleum sphondylium s.l.																								+														14			+	

relevé number	1	8	16	27	2	12	5	47	28	9	3	7	21	25	58	36	32	42	31	6	22	48	14	26	52	57	10	11	13	23	49	60	62	61					24	59	46
Arabis alpina																																	+					13			
Buddleja davidii																												r										13			
Erica carnea																																		+				13			
Juglans regia (pl)																														+								13			
Moehringia muscosa																													+									13			
Ostrya carpinifolia (c)																																		+				13		1	
Potentilla verna agg																												r										13			
Scrophularia canina																														+								13			
Senecio vulgaris																													r									13			
Solidago canadensis																												+										13			
Corylus avellana (pl)						r											+																		7	20	11				
Rubus saxatilis			+								+																								14		11				
Salix appendiculata (c)			+								+																								14		11				
Viola biflora							+			+																									14		11				
Campanula witasekiana												+																							7		5				
Carex ornithopoda							r																												7		5				
Clematis vitalba						+																													7		5		+	2a	
Erysimum cheirantoides													+																						7		5				
Euphorbia amygdaloides			+																																7		5				
Fallopia convolvulus									+																										7		5				
Lactuca serriola						+																													7		5				
Persicaria maculosa	r																																		7		5				
Poa annua	+																																		7		5				
Polypodium vulgare						+																													7		5				
Rosa canina agg						+																													7		5				
Rosa pendulina (c)			+																																7		5				
Rubus ulmifolius						+																													7		5				
Soldanella alpina							+																												7		5				
Aquilegia atrata																																								+	
Chenopodium album																																								r	
Cornus sanguinea (c)																																								+	
Crataegus monogyna (c)																																								+	
Plantago major																																							r		
Sonchus asper																																								r	

AP: Asiago Plateau
LR: Lagorai Range
TP: Tonezza Plateau
GM: Grappa Massif
pl: *plantulaeh*

Table 2: Relevés of the alliance *Epilobion angustifolii* in windstorm 'Vaia' forest clearings from SE Italian pre-Alps.

Tabela 2: Fitocenološki popisi zveze *Epilobion angustifolii* na gozdnih čistinah, nastalih po vetrolomu 'Vaia' v JV italijanskih Predalpah.

relevé number	29	53	30	55	44	41	54	50	37	63	65	64		
locality	M.ga Conseria	M.ga Conseria	M.ga Conseria	Valsolero	Doghetto de Spiado	Busa Grande	Valsolero	M.ga Conseria	M. Panarotta	Bieno	Bieno	Bieno		
coordinate N	46° 09.942'	46° 10.078'	46° 10.050'	46° 09.354'	46° 05.798'	46° 02.197'	46° 09.318'	46° 166698	46° 02.546'	-	-	-		
coordinate E	11° 32.049'	11° 32.092'	11° 32.028'	11° 25.673'	11° 35.662'	11° 18.134'	11° 25.638'	11° 531022	11° 19.648'	-	-	-		
date	17/8/21	17/8/21	20/9/20	20/8/21	2/8/21	29/7/21	20/8/21	3/10/21	29/7/21	1/9/85	1/9/85	1/9/85		
elevation (m)	1735	1740	1580	1585	1580	1335	1550	1700	1605	1250	1250	1250		
aspect	SE	SE	SE	SSE	SSE	ENE	SE	SE	S	-	-	-		
slope (°)	35	35	35	35	35	35	25	34	37	-	-	-		
relevé area (m2)	80	30	40	12	30	50	8	40	15	10	8	8		
herb layer (c) cover (%)	85	85	70	70	90	90	65	50	100	100	100	100		
lower shrub layer (B2) cover (%)	-	-	-	<5	-	<5	10	-	-	-	-	-		
species number	16	11	24	21	10	32	18	22	17	8	7	11		
cluster in Figure 3	H								I					
mountain area	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR		
													Ass1	C1
Ass1 *Senecioni-Galeopsietum tetrahit*														
Galeopsis tetrahit	5	5	4	4	4	4	3	1					100	
Senecio sylvaticus (All)	1	1	+					2b					50	
C1 *Epilobium angustifolium* community														
Epilobium angustifolium (All)			+		+	+			5	4	4	4	38	100
diff sp *Epilobion angustifolii* (All)														
Calamagrostis arundinacea	+	+	+	1	2a	+	+	+		+	1		100	50
Atocion rupestre	+	+	+	+	+	+	+	+		+		1	100	50
Luzula luzuloides	+	1	1	+	+	+	1	+	1				100	25
Avenella flexuosa	+	1	+		+	+		+		+			75	25
Vaccinium myrtillus	+					+	+						38	
char, diff sp *Epilobietea angustifolii*														
Epilobium montanum	+		+				+	+	1				50	25
Verbascum thapsus/thapsus	+		1	1				1					50	
Moehringia trinervia			+	+		+		+					50	
Senecio nemorensis/glabratus			+	r		+			+				38	25
Cirsium vulgare		+	+					2b					38	
Galeopsis pubescens				+		2a							25	
Geranium robertianum				+					+				13	25
Gnaphalium sylvaticum	+											+	13	25
Fragaria vesca									+			+		50
Eupatorium cannabinum						+							13	
Chaerophyllum aureum			+										13	
Galeopsis speciosa										+				25
char sp *Nardetea strictae*														
Veronica officinalis			+	1		+	+	+				+	63	25
Ajuga pyramidalis	+			+			+	+					50	

relevé number	29	53	30	55	44	41	54	50	37	63	65	64		
Carex leporina				+			+	1					38	
Agrostis capillaris						+							13	
char sp *Artemisietea vulgaris*														
Senecio inaequidens	+					+							25	
Tussilago farfara									+			+		50
Epilobium ciliatum				+									13	
Verbascum thapsus/montanus								1					13	
char sp *Robinietea*														
Rubus idaeus juv.	1	+	1	1	+	1	2a	1	2a	1		1	100	75
Sambucus racemosa (B2+c)	+	+	+	1	+	+	2a	+					100	
Sambucus nigra (c)						+							13	
char sp *Carpino-Fagetea*														
Hieracium murorum p.max.p.	+	+	1	+		+	1	+			+		88	25
Luzula nivea						1	+	1		+	2	1	38	75
Poa nemoralis				+		+	+		2a			+	38	50
Athyrium filix-femina						+			+		+		13	50
Viola reichenbachiana			+	r									25	
Prenanthes purpurea						+			+				13	25
Mycelis muralis						+							13	
Carex digitata			+										13	
Dryopteris dilatata							+						13	
Laburnum alpinum (pl)						r							13	
Cardamine impatiens									+					25
Dryopteris filix-mas									1					25
char sp *Vaccinio-Piceetea*														
Oxalis acetosella						1	+						25	
Veronica urticifolia						r					+		13	25
char sp *Molinio-Arrhenatheretea*														
Carex spicata						+							13	
Viola tricolor/saxatilis			+										13	
Deschampsia cespitosa								+					13	
Juncus effusus								+					13	
other														
Solidago virgaurea	+				+	+	+			+	+	1	50	75
Senecio cacaliaster		+	+		r				+				38	25
Urtica dioica			+	+		+		+	2a				50	25
Abies alba (B2+c)						1							13	
Anthoxanthum odoratum				+									13	
Cirsium arvense								+					13	
Cytisus hirsutus												+		25
Epilobium collinum						+							13	
Glechoma hederacea									+					25
Hypericum perforatum				+									13	
Silene dioica									+					25
Silene nutans s.l.			+										13	
Solanum dulcamara						+							13	
Sorbus aucuparia juv.							+						13	
Taraxacum sect. *Ruderalia*			r										13	

AP: Asiago Plateau
GM: Grappa Massif
TP: Tonezza Plateau
LR: Lagorai Range
pl: plantulae

Table 3: *Calamagrostis arundinacea*-rich relevés on base-rich and base-poor soils in windstorm 'Vaia' forest clearings from SE Italian pre-Alps.
Tabela 3: Popisi z vrsto *Calamagrostis arundinacea* na z bazami bogatih in siromašnih tleh na gozdnih čistinah, nastalih po vetrolomu 'Vaia' v JV italijanskih Predalpah.

relevé number	4	19	51	15	17	18	20	43	45	34	66	39	33	35	56	38	40			
locality	Fratton del Conte	M. Castellier Grande	V. d'Assa	Marcesina	Bosco Pergola	M. Agro	M.ga Buson	Doghetto de Spiado	Doghetto de Spiado	M.ga Conseria	Bieno	M. Panarotta	M.ga Conseria	M. Panarotta	Valsolero	M. Panarotta	M. Panarotta			
coordinate N	45° 56.365'	45° 58.724'	45° 56.977'	45° 56.252'	45° 53.531'	45° 905539	45° 58.375'	46° 05.715'	46° 05.899'	46° 09.976'	-	46° 02.553'	46° 09.931'	46° 02.525'	46° 09.351'	46° 02.600'	46° 02.550'			
coordinate E	11°35.394'	11°34.027'	11°24.818'	11°37.652'	11°23.707'	11°395938	11°34.713'	11°35.426'	11°35.961'	11°31.824'	-	11°19.533'	11°31.829'	11°19.474'	11°25.685'	11°19.690'	11°19.371'			
date	7/8/20	5/9/20	11/8/21	19/8/20	1/9/20	1/9/20	5/9/20	2/8/21	2/8/21	26/9/20	1/9/85	29/7/21	26/9/20	29/7/21	20/8/21	29/7/21	29/7/21			
elevation (m)	1440	1555	1240	1380	1620	1650	1440	1505	1505	1705	1260	1635	1660	1565	1570	1635	1575			
aspect	NNW	ESE	NW	N	NE	SE	E	S	SE	SSE	S	SSE	SSE	ESE	SE	SE	S			
slope (°)	19	26	24	24	25	25	28	36	23	45	40	17	30	23	40	25	16			
relevé area (m2)	80	40	40	60	50	80	25	25	25	25	20	30	20	50	25	30	30			
herb layer (c) cover (%)	100	90	100	90	100	95	100	95	100	100	100	100	100	100	100	95	90			
shrub layer (B1+B2) cover (%)	10	-	10	5	<5	<5	-	5	<5	<5	-	5	-	<5	-	-	-			
species number	41	36	45	44	38	24	32	20	10	22	18	19	25	13	16	15	10			
cluster in Figure 3	F							E								G				
mountain area	AP	AP	AP	AP	AP	AP	AP	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR			
	calcareous bedrock (C1)							acidic bedrock (C2)										C1	C2	C2_v
C1+C2 *Calamagrostis arundinacea* communities																				
Calamagrostis arundinacea	4	4	4	4	5	5	5	4	4	5	5	5	5	5	5	+	1	100	100	2
C2_v *Avennella flexuosa* variant																				
Avenella flexuosa								2b	2a	+	+	+	+	2b		5	4		88	2

relevé number	4	19	51	15	17	18	20	43	45	34	66	39	33	35	56	38	40			
char sp *Mulgedio-Aconitetea*																				
Senecio cacaliaster	+			1						+		2a	+	+	+			29	63	
Cirsium erisithales			+		+	+					+							43	13	
Geranium sylvaticum	+	+				+	+											57		
Phyteuma spicatum+ovatum	+				+	+												43		
Geum rivale		+					+											29		
Ranunculus platanifolius				+	+													29		
Aconitum lycoctonum agg						+												14		
Adenostyles alliariae						1												14		
Myrrhis odorata					1													14		
Calamagrostis villosa										1									13	
Carduus personata													+						13	
Epilobium alpestre											+								13	
char, diff sp *Epilobietea angustifolii*																				
Fragaria vesca	+	1	1	+			1			+	+	+	+					71	50	
Petasites albus	+		+	+														43		
Galeopsis tetrahit										+			+		+	+	+		38	2
Epilobium montanum				+						+		+						14	25	
Galeopsis pubescens			r					r				+						14	25	
Epilobium angustifolium											2	1	+						38	
Galeopsis speciosa					r													14		
Senecio nemorensis/glabratus										+									13	
Galium aparine														r					13	
char sp *Nardetea strictae*																				
Agrostis capillaris		+					+				+		2a					29	25	
Potentilla erecta	+	+					+											43		
Veronica officinalis		+	+										+					29	13	
Calluna vulgaris								+		+	+					+			38	1
Hypericum maculatum					r	+												29		
Viola canina											+	r							25	
Ajuga pyramidalis										+									13	
char sp *Robinietea*																				
Rubus idaeus juv.	2a		+	+	+	+	+	2b	2a	+	1	+	1	2a	+	+	1	86	100	2
Sambucus racemosa (B2+c)			+					+	+		+		r	+	+			14	75	

relevé number	4	19	51	15	17	18	20	43	45	34	66	39	33	35	56	38	40			
Salix capraea (B2+c)	+							1				+		+				14	38	
Sambucus nigra (c)		r																14		
char sp *Carpino-Fagetea*																				
Hieracium murorum p.max.p.	+	1	+	+	1	+	+			1		r	+		+	1	+	100	50	2
Prenanthes purpurea	+		+	+	2a	2b	+	+			+		1	+	+			86	63	
Luzula nivea	2a	1	1	2b	1	+	+			1	+		2a					100	38	
Athyrium filix-femina	+		+	+	r		+	+		+		1	+		+			71	63	
Polygonatum verticillatum	+	+	+	1	1	1	+											100		
Aposeris foetida	+	+		+	+	+	+											86		
Euphorbia carniolica	1	1	+	+	+		+											86		
Carex digitata	+	+	+	+			+											71		
Lonicera alpigena			+	+	+	+												57		
Paris quadrifolia	+		+			r	+											57		
Dryopteris filix-mas			+	+			+					+						43	13	
Aremonia agrimonoides	+	+		+														43		
Lamium galeobdolon				+	+	1												43		
Melica nutans	+	+		1														43		
Phegopteris connectilis	+		2a	+														43		
Viola reichenbachiana		+					+						+					29	13	
Dryopteris dilatata			+		+										+			29	13	
Aruncus dioicus			+	+														29		
Gymnocarpium dryopteris	+			+														29		
Actaea spicata			+															14		
Anemonoides trifolia	+																	14		
Cardamine pentaphyllos			+															14		
Cardamine trifolia				2a														14		
Carex alba			+															14		
Carex sylvatica				+														14		
Daphne mezereum					+													14		
Drymochloa sylvatica			+															14		
Fagus sylvatica (pl)				+														14		
Lilium martagon					+													14		
Polystichum aculeatum				+														14		
Pulmonaria officinalis							+											14		
Ranunculus nemorosus		+																14		
Poa nemoralis												+							13	
Populus tremula (B2)								+											13	

relevé number	4	19	51	15	17	18	20	43	45	34	66	39	33	35	56	38	40			
char sp *Vaccinio-Piceetea*																				
Oxalis acetosella	+	+	1	1	+		+						+		+			86	25	
Maianthemum bifolium	+	+	+	+	+		+								+			86	13	
Vaccinium vitis-idaea	+	1	1			+			+	r			+			1		57	38	1
Homogyne alpina	1	+			+	+	+	+								+		71	13	1
Picea abies (B2+c)			+		r		r	1		+			+			+		43	38	1
Veronica urticifolia	+		1	1	+		+											71		
Luzula sylvatica/sieberi	1	2a			+		+											57		
Lonicera nigra (B2)	+			+	+													43		
Melampyrum sylvaticum			+	+														29		
Clematis alpina		+																14		
Huperzia selago				+														14		
Lonicera nigra (c)			+															14		
Lycopodium annotinum			2a															14		
Larix decidua (pl)											+								13	
other																				
Vaccinium myrtillus	2a	2a	1	2a	+	+	1	1	1	1	+		+		1	3	1	100	75	2
Solidago virgaurea		+		+			+	+	+	+	+	+	1	+	+	1	1	43	100	2
Sorbus aucuparia (c)	2a	r	1		+	+	+		+					+	+	+	+	86	38	2
Rubus saxatilis	2a	1	1	1	+	+	1											100		
Rosa pendulina (B2+c)	1	r	1	+	+	+	+											100		
Luzula luzuloides								2a	1	1		1		1	3	+	2b		75	2
Abies alba (pl)	+	r	+		r	r												71		
Valeriana tripteris	1	+	+	+	+													71		
Carex austroalpina	+		+	+	+													57		
Salix appendiculata (c)			+		r					+								29	13	
Sorbus aucuparia (B1+B2)	1			+										+				29	13	
Alchemilla vulgaris agg		r		+														29		
Asplenium viride	+		+															29		
Cruciata glabra		+					+											29		
Viola biflora	+			+														29		
Galium mollugo agg			+									+						14	13	
Lotus corniculatus										+		+							25	
Cytisus hirsutus											+	+							25	
Pteridium aquilinum								+	1										25	
Ajuga reptans					+													14		
Trollius europaeus						+												14		

relevé number	4	19	51	15	17	18	20	43	45	34	66	39	33	35	56	38	40			
Veronica chamaedrys				+														14		
Acer pseudoplatanus (pl)			+															14		
Adenostyles alpina					+													14		
Anthoxanthum odoratum		r																14		
Erica carnea		+																14		
Calamagrostis varia				+														14		
Carex montana							2a											14		
Festuca rubra agg			r															14		
Gymnocarpium robertianum	+																	14		
Helleborus niger					+													14		
Parnassia palustris		+																14		
Campanula witasekiana													+			+			13	1
Carex ornithopoda								+											13	
Epipactis atrorubens														1					13	
Betula pendula (B2+c)								+								+			13	
Campanula barbata										+									13	
Cirsium arvense													+						13	
Corylus avellana (B2)								+											13	
Dactylorhiza maculata/fuchsii													+						13	
Molinia arundinacea								+											13	
Phyteuma betonicifolium+zahlbruckneri															+				13	
Taraxacum sect. Ruderalia													r						13	
Valeriana officinalis agg											+								13	
Melampyrum pratense																	+			1

AP: Asiago Plateau
LR: Lagorai Range
TP: Tonezza Plateau
GM: Grappa Massif
pl: *plantulae*

Table 4: *Rumex acetosella*-dominated relevés coming from 'Vaia' windstorm clearings in a *Fagus* forest afforested with *Picea abies* in the easternmost Venetian pre-Alps.

Tabela 4: Popisi z dominantno vrsto *Rumex acetosella* na gozdnih čistinah v najbolj vzhodnih Beneških Predalpah, nastalih po vetrolomu 'Vaia' na bukovih rastiščih in pogozdenih s smreko..

relevé	A	B
locality	Le Crosere	Le Crosere
coordinate N	46° 00.582'	46° 00.562'
coordinate E	12° 13.432'	12° 13.422'
date	14/7/23	14/7/23
elevation (m)	1135	1130
aspect	SE	SSE
slope (°)	29	26
relevé area (m2)	25	25
herb layer (c) cover (%)	100	95
shrub layer (B1+B2) cover (%)	-	-
species number	11	15
mountain area	VR	VR
C1 *Rumex acetosella* community		
Rumex acetosella (All)	5	5
diff sp *Epilobion angustifolii* (All)		
Calluna vulgaris	+	
Carex pilulifera	+	
char, diff sp *Epilobietea angustifolii*		
Agrostis capillaris	1	1
Hypericum perforatum	1	1
Dryopteris carthusiana	+	+
Epilobium montanum	+	r
Fragaria vesca		+
char sp *Nardetea strictae*		
Veronica officinalis	1	1
Potentilla erecta	+	+
Carex pallescens	+	+
other		
Rubus idaeus juv.	+	+
Carex pairae		+
Athyrium filix-femina		+
Betula pendula juv.		+
Luzula nivea		+
Dryopteris filix-mas		+

VR: Col Visentin Ridge