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A new plant community with the strictly endemic *Cirsium alpis-lunae* (Asteraceae) in the Northern Apennines (Italy) and considerations on the alliances *Senecionion samniti* and *Adenostylion alpinae*

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Abstract. We conducted a phytosociological study of the particular coenoses with presence of *Cirsium alpis-lunae*, a strictly endemic species living in marly-arenaceous montane screes of the Apennines between Tuscany, Emilia-Romagna and Marche. We surveyed all the reported locations and analyzed the coenological and ecological features of the communities by means of standard statistical methods, describing a new association, *Laserpitio latifolii-Cirsietum alpis-lunae*. We attributed the new association to *Mulgedio-Aconitetea*, but we noted in the literature some nomenclatural misinterpretations concerning the syntaxonomic treatment of this Apennine vegetation at the order and alliance level. We found that *Adenostylion alpinae* is the most suitable alliance to encompass *Laserpitio latifolii-Cirsietum alpis-lunae* and it cannot be considered a synonym of *Senecionion samniti*. *Senecionion samniti* was here lectotypified, and seems to be closer to *Molinio-Arrhenetheretea* than to *Mulgedio-Aconitetea*.
Keywords: *Cirsium alpis-lunae*; Ecology; Phytosociology; screes; Syntaxonomy; vegetation.

Una nueva asociación de *Cirsium alpis-lunae* (Asteraceae) endémica de los Apeninos del Norte (Italia) y consideraciones sobre las alianzas *Senecionion samniti* y *Adenostylion alpinae*

Resumen. Se presenta el estudio fitosociológico de las comunidades con presencia de *Cirsium alpis-lunae*, una especie estrictamente endémica que vive en taludes o pedreras margoso o arenosas de los Apeninos entre la Toscana, Emilia-Romagna y Marche. El estudio de todas las localidades conocidas y el análisis de sus características ecológicas mediante los métodos estadísticos estándar permitieron describir una nueva asociación, *Laserpitio latifolii-Cirsietum alpis-lunae*. Esta nueva asociación adscribimos a la clase *Mulgedio-Aconitetea*, pero nos encontramos con las dificultades a ubicarla a nivel de orden y alianza por las malinterpretaciones nomenclaturales bibliográficas sobre el tratamiento sintaxonómico de esta vegetación de los Apeninos. Consideramos que la alianza más adecuada para abarcar *Laserpitio latifolii-Cirsietum alpis-lunae* es *Adenostylion alpinae* y que ésta no se puede considerar como un sinónimo de *Senecionion samniti*. En este trabajo se lectotipifica *Senecionion samniti* que parece estar más relacionado con *Molinio-Arrhenetheretea* y no con *Mulgedio-Aconitetea*.
Palabras clave: *Cirsium alpis-lunae*, Ecología, Fitosociología, taludes; pedreras; Sintaxonomía; vegetación

Introduction

Cirsium alpis-lunae Brilli-Cattarini & Gubellini (Asteraceae) is a strictly endemic yellow-flowered thistle rather recently discovered and described in the northern Apennines, near the conventional border with the central Apennines (Brilli-Cattarini & Gubellini, 1991). Its occurrence was investigated and reported in regional and national floristic and vegetation studies (Raffaelli & Rizzotto, 1991; Gonnelli, 1995; Viciani *et al.*, 2002, 2004, 2010; Conti *et al.*, 1997, 2005, 2007; Casavecchia *et al.*, 2014; Gennai *et al.*, 2015; Bartolucci *et al.*, 2018). Nonetheless, because of the difficulties in accessing its typical sites of occurrence, coenological surveys concerning the communities where it grows had never been conducted yet. It lives typically on humid and unstable steep slopes, on well drained earthy screes derived from sandstone-marly flysch substrata, at altitudes between 1100 and 1300 m asl (Brilli-Cattarini & Gubellini, 1991). This species needs a good water availability, mainly supplied by the rainfalls. The open areas colonized by *C. alpis-lunae* are generally in contact with neighboring *Fagus sylvatica* dominated woods.

This thistle is morphologically and taxonomically similar to other Italian *Cirsium* species such as *C. erisithales, C. carniolicum, C. oleraceum, C. spinosisimum* and *C. bertolonii*, and according to its ecological requirements can be considered markedly meso-hygrophilous, microthermal and rather nitrophilous (Brilli-Cattarini & Gubellini, 1991).

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From the phytosociological point of view, no data about this species are nowadays available. On the basis of its growth form (perennial hemicryptophyte megaforbic) and its preferential habitat, the class *Mulgedio-Aconitetea* has been taken into account in order to classify the coenoses characterized by this peculiar species. However, the articulation of this vegetation class in the lower-ranking syntaxa failed in the comparison among recent specialist works and vegetation prodromes, particularly concerning the syntaxonomic treatment of the Apennine communities at the order and alliance levels (Michl *et al*., 2010; Biondi *et al*., 2014b; Mucina *et al*., 2016; Škvorc *et al*., 2017).

Therefore the aims of this work were: i) to investigate the synecology of *Cirsium alpis-lunae* in order to better understand the biotic preferences and the conservation status of this endemic species, for which sound auto-ecological studies are lacking; ii) to analyze and classify from the syntaxonomical point of view the communities in which this species has an important role; iii) to discuss and clarify some nomenclatural misinterpretations emerging from the literature analysis as concerning the syntaxonomic treatment of the Apennine vegetation of the class *Mulgedio-Aconitetea*.

Materials and Methods

Study area

Cirsium alpis-lunae is present only in two small areas of the northern Apennines, in the "Alpe della Luna" massif and in the "Monte Nero" massif, located near the border between Tuscany, Emilia-Romagna and Marche administrative regions (Figure 1), but with sites geographically located in the Adriatic side of the Italian peninsula. The study area lies in a Temperate Oceanic Bioclimate (Pesaresi *et al*., 2017). Geological substrates are mainly constituted by sandstones, siltstones and marls, generally rather rich in Ca and nutrients (see Bini *et al*., 1982; Carmignani *et al*., 2013). The two areas are included respectively in the Tuscan SACs (Special Areas of Conservation), IT5180010 (Alpe della Luna) and IT5180006 (Alta Valle del Tevere). Near the *C. alpis-lunae* sites located along the southern border of SAC IT5180010 also a Marche SAC is present (IT5310010, Alpe della Luna - Bocca Trabaria). More detailed information concerning characteristics of *C. alpis-lunae* sites can be found in Brilli-Cattarini & Gubellini (1991), Gonnelli (1995), Viciani *et al*. (2002, 2004), Casavecchia *et al*., 2014; Gennai *et al*. (2015).

The vegetation survey

Even if some phytosociological territorial surveys encompassing *Cirsium alpis-lunae* distribution area existed (Viciani *et al*., 2002, 2004; Casavecchia *et al*., 2014), no relevé with this thistle was reported. As above mentioned, this lack of data is mainly due to the difficulty of exploration of the habitat occupied by this species, constituted by steep and unstable slopes, which cannot be visited without specific techniques and mountaineering equipment for vertical works (as we did). We surveyed all the known locations where occurrences of *C. alpis-lunae* plants were reported (Brilli-Cattarini & Gubellini, 1991; Raffaelli & Rizzotto, 1991; Gonnelli, 1995; Viciani *et al*., 2002, 2004; Casavecchia *et al*., 2014; Gennai *et al*., 2015) and carried out 16 surveys using the phytosociological method (Braun-Blanquet, 1932, 1951; Biondi, 2011). We surveyed all the sites where *C. alpis-lunae* had a relevant cover value, i.e. where it was equal or more than 2 of Braun-Blanquet scale. We did not use standard plots with fixed side, but we found that in all the sites a surface area of about 16 m^2 was suitable to represent the floristic composition and the uniformity of physiognomy and site conditions (at least for the relevés of open areas, i.e. those of Group 1 in Table 1). We therefore adopted this surface area in order to be able to compare data easily and consistently with each other. The locations of the surveys are shown in Figure 1.

Data analysis

We performed a cluster analysis (hierarchical classification) on a matrix of 85 species × 16 relevés, after transforming it to an ordinal scale according to the method of Van der Maarel (1979) and Noest *et al*. (1989). We used average linkage (UPGMA) and Euclidean distance measures in the program Syntax V (Podani, 2002) to identify groups of similarity. For the cluster analysis, all the woody species of the tree and shrubby layers have been grouped. In order to characterize the ecology of the groups resulting from the cluster analysis, a Principal Component Analysis (PCA) was performed using the function *prcomp* in the R environment (R Core Team). The PCA was based on the weighted means, based on the floristic composition of each relevé, of the Ellenberg/Pignatti Ecological Indicator Value (EIV) for temperature, nutrients, moisture, soil reaction and continentality (Ellenberg *et al*., 2001; Pignatti, 2005; Guarino *et al*., 2012). *Cirsium alpis-lunae* was excluded from the analysis (also considering that for this species the indicator values were not available in the literature and that, to our knowledge, this species was not subject to any particular auto-ecological study).

Nomenclature

Citations of *syntaxa* and floristic species names are provided without authors in the text. Complete *syntaxa* names are reported in the syntaxonomic scheme with a list of other *syntaxa* quoted. Complete species names are reported in the Table 1. For syntaxonomic nomenclature we consulted the updated Italian schemes (Biondi *et al*., 2014a, 2014b; Biondi & Blasi, 2015) and the European ones (Mucina *et al*., 2016), whereas the nomenclature of species is given according to Bartolucci *et al*. (2018).

Table 1. *Cirsium alpis-lunae* communities.
Laserpitio latifolii-Cirsietum alpis-lunae ass. nova (group 1)
Phytocoenoses showing increased cover of woody species (group 2)
(*Adenostylion alpinae*, *Adenostyletalia alliariae*, *Mulgedio-Aconitetea*)

Altitude (1=10 m asl)	113	118	115	115	113	127	113	127	112	119	117	112	115	115	115	115
Area (m2)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Slope (%)	100	100	50	85	85	100	90	40	100	100	100	100	100	100	75	100
Exposure	N	N	NE	NNW	N	SE	NE	N	NNE	NE	NE	NE	NE	N	NE	NE
Cover trees (> 5m)	0	20	0	0	0	20	0	0	90	60	95	80	70	50	20	40
Cover trees (0.5-5 m)	6	1	8	3	3	1	0	0	12	0	20	20	0	3	30	20
Cover herbs	90	90	90	95	95	80	60	99	75	90	90	90	85	50	80	90
Group N.	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
Rel. N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Characteristics																
Cirsium alpis-lunae Brilli-Catt. & Gubellini	3	3	4	4	5	3	4	5	2	2	2	2	3	3	3	3
Laserpitium latifolium L.	2	2	1	2	1	1	+	+	.	2	1	2	1	1	.	.
Adenostyles australis (Ten.) Iamonico & Pignatti	1	2	1	2	1	.	1	1	2	.	.	1	2	.	.	1
Hieracium murorum L. s.l.	1	.	.	.	.	.	.	.	.	1	.	1	1	1	1	1
Valeriana tripteris L.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Characteristics of *Mulgedio-Aconiteteta* and transgressives of *Trifolio-Geranietea, Galio-Urticetea*																
Aegopodium podagraria L.	+	.	1	1	+	.	+	1	.	.	.	.	.	.	1	1
Bupleurum falcatum L. subsp. *cernuum* (Ten.) Arcang.	.	.	.	.	.	.	.	.	.	.	1	1	+		1	+
Vicia sepium L.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.
Trangressives of *Fagetalia, Querco-Fagetea*																
Euphorbia dulcis L.	+	.	+	.	.	1	+	.	+	.	.	+	1	+	+	+
Dryopteris borreri (Newman) Newman ex Oberh. & Tavel.	.	.	2	2	.	1	1	1	1	.	.	1	2	2	.	3
Primula vulgaris Huds.	.	.	.	.	.	.	+	.	1	.	1	1	1	.	1	1
Geranium nodosum L.	.	1	1	1	1	.	.	+	1	.	.	.	.	.	.	.
Emerus major Mill.	.	.	+	.	.	.	.	.	.	1	1	.	1	.	+	1
Campanula trachelium L.	.	.	+	1	+	1	.	.	1	.	.	.	.	.	+	.
Solidago virgaurea L.	.	.	.	.	.	.	1	.	1	.	.	.	+	+	+	+
Acer opalus Mill. subsp. *obtusatum* (Waldst. & Kit. ex Willd.) Gams (pl.)	.	.	.	.	.	.	.	.	.	+	.	1	1	.	+	+
Hepatica nobilis Mill.	.	.	.	.	.	.	.	.	.		1	.	+	+	+	+
Centaurea montana L.	.	1	.	1	1	.	.	.	.	.	1	1	.	.	.	.
Laburnum alpinum (Mill.) Bercht. & J.Presl (pl.)	.	.	.	.	.	.	.	.	.	+	+	.	+	.	+	+
Prenanthes purpurea L.	.	.	.	1	.	.	.	.	.	.	1	+	1	.	.	.
Fagus sylvatica L. (pl.)	.	.	.	.	.	.	.	.	.	.	+	.	1	.	+	+
Anemonoides trifolia (L.) Holub	.	.	.	.	.	.	.	.	+	.	2	1	.	.	.	.
Aquilegia dumeticola Jord.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	1	.

Fraxinus ornus L. (pl.)	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.
Sorbus aria (L.) Crantz (pl.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
> 5m layer																
Fagus sylvatica L.	.	2	.	.	.	2	.	.	5	.	5	3	3	3	2	2
Laburnum alpinum (Mill.) Bercht. & J.Presl	.	.	.	.	.	.	.	.	.	2	1	.	2	.	.	1
Ostrya carpinifolia Scop.	.	.	.	.	.	.	.	.	.	3	.	3	2	.	1	2
Sorbus aria (L.) Crantz	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	1
0,5-5m layer																
Acer opalus Mill. subsp. *obtusatum* (Waldst. & Kit. ex Willd.) Gams	.	.	.	1	.	.	.	.	.	.	.	1	.	.	.	.
Acer pseudoplatanus L.	1		1		1	.	.	.	1	.	.	.	.	.	.	.
Fagus sylvatica L.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1
Fraxinus excelsior L.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.
Laburnum alpinum (Mill.) Bercht. & J.Presl	.	1	.	.	.	.	.	.	1	.	2	2	.		1	1
Ostrya carpinifolia Scop.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	2	1
Sorbus aria (L.) Crantz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1
Other species																
Brachypodium genuense (DC.) Roem. & Schult.	3	3	2	1	1	3	1	.	3	1	4	4	2	2	1	2
Carex macrolepis DC.	.	.	.	.	.	.	+	.	.	.	1	1	2	1	2	1
Linum viscosum L.	.	.	.	.	r	.	.	.	.	1	.	.		+	+	+
Sesleria italica (Pamp.) Ujhelyi	.	.	.	.	.	.	.	.	.	1	.	.	1	2	3	1
Clematis vitalba L.	.	.	.	.	1	1	.	.	1	1	.	.	.	.	.	.
Genista tinctoria L.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1
Salvia glutinosa L.	.	.	.	.	+	1	+	.	.	.	.	.	.	.	.	.
Galium album Mill.	.	.	.	.	.	.	.	1	.	1	+	.	.	.	.	.
Rubus idaeus L. subsp. *idaeus*	1		1	.	.	.	.	1	.	.	.	.	.	.	.	.
Doronicum columnae Ten.	.	.	.	.	.	.	.	.	1	1	+	.	.	.	.	.
Gymnadenia conopsea (L.) R.Br.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Bromopsis ramosa (Huds.) Holub subsp. *ramosa*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.
Scabiosa columbaria L.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1
Lotus corniculatus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Cytisophyllum sessilifolium (L.) O.Lang	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
Arenaria bertolonii Fiori	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.

Other species: Characteristics of *Mulgedio-Aconiteteta* and transgressives of *Trifolio-Geranietea, Galio-Urticetea*: *Helleborus viridis* subsp. *bocconei* 1 in 2; *Thalictrum aquilegiifolium* + in 5; *Fragaria vesca* 1 in 6; *Polygonatum verticillatum* r, *Heracleum sibiricum* subsp. *ternatum* and *Urtica dioica* 1 in 8. Trangressives of *Fagetalia*, *Querco-Fagetea*: *Lamium galeobdolon* and *Polystichum aculeatum* + in 3; *Convallaria majalis* + in 4; *Geranium robertianum* + in 7; *Cardamine enneaphyllos* and C. *heptaphylla* 1 in 9; *Dianthus hyssopifolius* + in 11; *Daphne laureola*, *Euphorbia amygdaloides* and *Abies alba* +, *Ostrya carpiniifolia* and *Lathyrus vernus* 1 in 16; 0,5-5m layer: *Abies alba* + in 16. 0,5-5m layer: *Rosa sp.* 1 in 3; *Prunus avium* 1 in 6; *Cytisophyllum sessilifolium* 1 in 16. Other species: *Orobanche sp.* r in 3; *Equisetum arvense* and *Rubus hirtus* 1 in 5; *Leucanthemum vulgare* subsp. *vulgare* 1 in 6; *Lathyrus pratensis* L. subsp. *pratensis* r, *Poa nemoralis* 1 in 8; *Hypericum perforatum* +, *Carlina acanthifolia* 1 in 10; *Vicia villosa* + in 15; *Carex flacca* and *Leontodon hispidus* subsp. *hispidus* 1 in 16.

Localities: 1-3: Seccaroni, Alpe della Luna, coord. geogr.: 43.662539/12.171500, 43.661888/12.170220, 43.661830/12.170049; 4-6: Bucine, Alpe della Luna, coord. geogr.: 43.644459/12.184818, 43.644203/12.185573, 43.644382/12.186265, *holotypus ass.* rel. 5; 7: Cucco, Alpe della Luna, coord. geogr.: 43.64930712.171696; 8, 15,16: Monte Nero, Monte Nero-Poggio Bastione, coord. geogr.: 43.763287/12.011404, 43.763429/12.010990, 43.763827/12.010748; 9, 11, 14: Ripa Luna, Alpe della Luna, coord. geogr.: 43.655145/12.170255, 43.655410/12.170765, 43.655249/12.171079; 10: Ripa Bianca. Alpe della Luna, 43.664060/12.162415; 12: Poggio Bastione, Monte Nero-Poggio Bastione, 43.764711/12.008618; 13: Poggio Bastione, Monte Nero-Poggio Bastione, coord. geogr.: 43.764857/12.009741

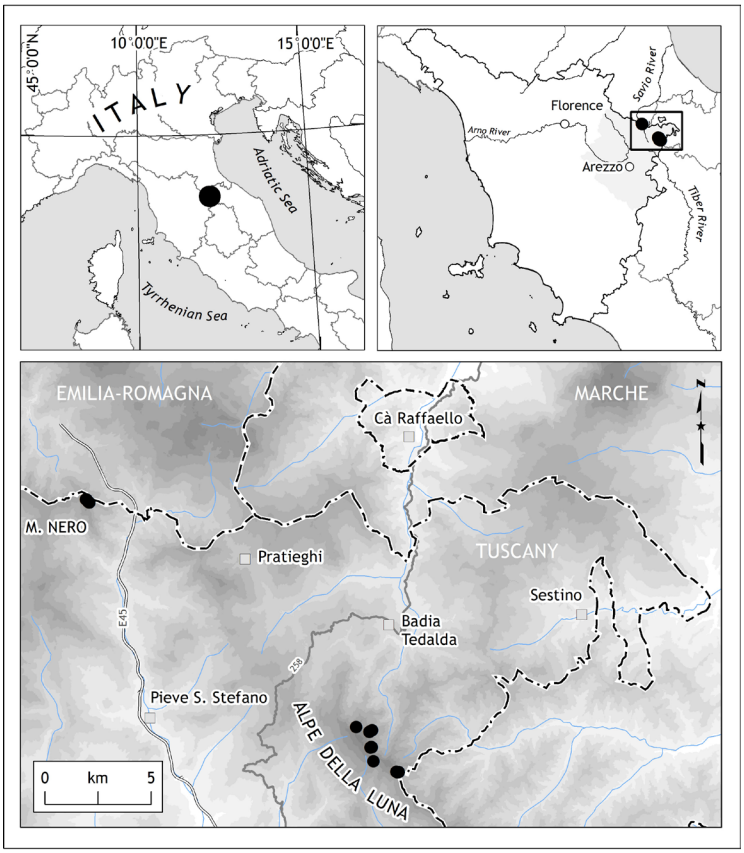

Figure 1. Location of the study area and distribution map of the surveyed sites of *Cirsium alpis-lunae* communities.

Results and Discussion

The cluster analysis showed that the relevés can be divided in two main groups (Figure 2). The first group (Group 1) includes the relevés located in more open sites, where cover of higher woody layers is not relevant and the thistle is widespread (Table 1). Conversely, in the second group (Group 2), the shrub and tree cover is higher and *Cirsium alpis-lunae* has lower abundance values, seeming to be less competitive.

The variance explained by the first two axes of the PCA resulted to be high, namely 55% for axis I and 30% for axis II. The PCA ordination with respect to EIV values showed that many of the relevés in which *C. alpis-lunae* had high cover values (Group 1) seem to be related to the most micro-thermic and relatively high-pH sites (Figure 3). Humidity and nutrient levels are probably very comparable in all the relevés, and seem not to be pivotal, while most part of Group 1 relevés is clearly related to more open sites, where light intensity is higher (Figure 3).

From a synecological viewpoint, the phytocoenoses richer in *C. alpis-lunae* seem therefore to be favored by the instability of the upper parts of marly-arenaceous conoids close to mountain ridges. In such contexts the continuous formation and reshaping of screes (which hinder the establishment of the forest), the proximity to forest soils (supplying a good level of nutrients) and the absence of a relevant tree cover may provide the necessary ecological requirements in terms of light, pH, nutrients and temperature.

We propose a new association for these peculiar plant communities (relevés of Group 1 in Table 1), with the name *Laserpitio latifolii-Cirsietum alpis-lunae ass. nova hoc loco (holotypus:* rel. 5, Table 1). The association is characterized by *C. alpis-lunae* itself, which is dominant or has relevant cover values, and is differentiated by *Laserpitium latifolium*, a constant species in the community. As to the higher syntaxa, both for the ecological-geomorphological features of the phytocoenoses (mountain micro-thermic earthy screes) and the floristic-systematic aspects (*C. alpis-lunae* can be considered a mega-forb, with needs and behavior comparable to those of the most similar *Cirsium* species, i.e. *C. spinosisimum, C. bertolonii* and *C. erisithales*), the reference class is *Mulgedio-Aconitetea*. Another well represented species typical of this class is *Adenostyles australis* (a southern taxon of *A. glabra* group), while some other species of *Mulgedio-Aconitetea* are only sporadically present (*Thalictrum aquilegiifolium*, *Valeriana tripteris*). Many plants of other classes (particularly *Trifolio-Geranietea* and *Galio-Urticetea*) are also important in the floristic composition of these conenoses; this group of species testifies the rather nitrophilous condition of the habitat and in particular the presence of the woody vegetation at the edge of the open areas where this vegetation type lies. For this reason, *Laserpitium latifolium,* which is generally considered as belonging to *Trifolio-Geranietea,* was selected as differential species of the association. Moreover, in the association the presence of some plants of grasslands and open areas (*Brachypodium genuense, Sesleria italica*) and of many ingressive nemoral species coming from the neighboring forests can be observed.

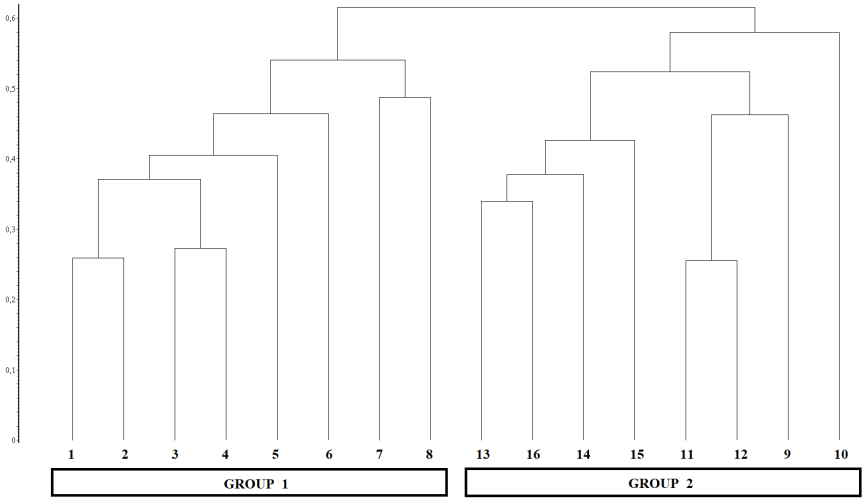

Figure 2. Dendrogram resulting from cluster analysis of *Cirsium alpis-lunae* relevés. The number of relevé group is the same indicated in Table 1.

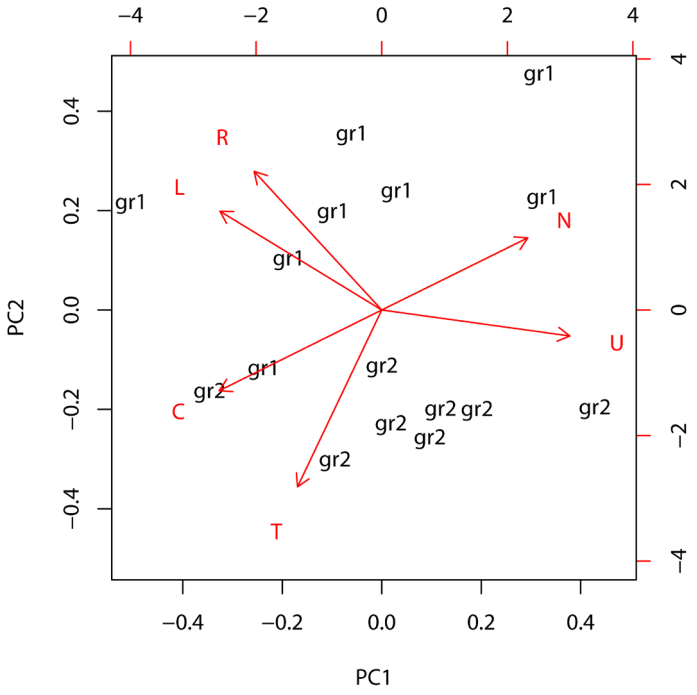

Figure 3. PCA ordination diagram of *Cirsium alpis-lunae* relevé groups resulting from cluster analysis. Abbreviations are: gr1, Group 1; gr2, Group 2; Vectors: L, Light; T, Temperature; U, Moisture; N, Nitrogen ; C, Continentality; R, Soil pH.

References to syntaxonomic order and alliance were more questionable. Castelli *et al.* (2001) established a new alliance for plant communities located in the Piedmont Apennines, growing in ecological and geomorphological locations similar to those of *Laserpitio latifolii-Cirsietum alpis-lunae* (open areas in steep, north-facing earthy screes at high altitudes, near beech forests) and with some floristic affinities (high cover of *Adenostyles glabra, Valeriana tripteris*, presence of nemoral species). The alliance was subsequently validated by Biondi *et al.* (2014a) with the name *Adenostylion alpinae* of the new suborder *Adenostylenalia alpinae*, representing the geographical vicariant of the alpine vegetation with *A. alliaria*. The authors attributed this new alliance to *Adenostyletalia alliariae* order. Afterwards, Mucina *et al.* (2016) considered *Adenostylion alpinae* as a later synonym of *Senecionion samniti*, attributed to *Petasito-Chaerophylletalia*; Bonin (1978) considered

Senecionion samniti including humid vegetation types of little streams flowing in mountain grasslands, in sites with no or little inclination (from 0 to 5-10%), at altitudes of 1500-1950 m asl. He described two associations, *Blysmo-Juncetum depauperatae* and *Luzuletum calabrae*, and included them in this new alliance. He indicated as characteristic species of *Senecionion*: *Senecio cordatus* var. *samnitum* (today: *Jacobaea alpina* subsp. *samnitum*), *Juncus conglomeratus, J. thomasii, J. articulatus* and *Carex leporina*. Most of these species cannot be considered mega-forbs, or at least are strictly linked to muddy and constantly humid soils, and so other plants with relevant cover in these phytocoenoses (i.e. *Luzula calabra, Deschampsia caespitosa, Prunella laciniata, Potentilla erecta, Carex vesicaria, Eleocharis palustris*, etc., see tables 13 and 14 in Bonin 1978). Bonin attributed in fact his *Senecionion* to *Holoschoenetalia* and *Molinio-Juncetea.* In order to decide if this attribution is correct, a lectotypification is probably necessary because, as already pointed out by Bonin (1978) himself and later by De Foucault & Catteau (2012), the two associations *Blysmo-Juncetum depauperatae* and *Luzuletum calabrae* are rather different. The seven relevés forming the original table of *Blysmo-Juncetum depauperatae* were firstly published by Bonin (1972) as "*Blysmus compressus* and *Juncus depauperatus* association" (Table 3 in Bonin 1972) and later by Bonin (1978) as *Blysmo-Juncetum depauperatae* ass. nova (Table 13 in Bonin 1978). In accordance with Weber *et al*. (2000) the association was validly published in 1972. *Luzuletum calabrae* was validly described by Bonin (1978, Table 14). As to the type of the alliance, in our opinion *Luzuletum calabrae* is less suitable than *Blysmo-Juncetum depauperatae*: in *Luzuletum calabrae* association also species from *Scheuchzerio palustris-Caricetea fuscae* are present with relevant cover (e.g. *Carex nigra* subsp. *intricata, C. echinata*) and *Senecio cordatus* var. *samnitum* is more sporadic. Thus, *Blysmo-Juncetum depauperatae* association is here designated as the lectotypus of *Senecionion samniti* alliance. As above mentioned, Bonin (1978) attributed his *Senecionion* to *Holoschoenetalia* and *Molinio-Juncetea* (today *Molinio-Arrhenatheretea*), and we agree with this attribution, for the general floristic composition and the ecologic, edaphic and geomorphologic features of sites.

Regardless the syntaxonomic position of *Senecionion,* our analysis showed that *Adenostylion alpinae* cannot be considered a synonym of it, because the ecological-environmental characteristics and the floristic composition are quite different: no one of the species designated by Bonin (1978) as characteristic of *Senecionion* are present in *Adenostylion alpinae* original table. Indeed, the *Adenostylion alpinae* alliance description states that it includes "Communities of megaforbs that grow in the supratemperate thermotype of the Apennines on constantly humid, rocky-earthy, north-facing, mountainsides" (Biondi *et al*., 2014a; Biondi & Blasi, 2015), and that the diagnostic taxa are *Adenostyles alpina, Valeriana tripteris* and *Hieracium murorum*. In our opinion *Adenostyles alpina* (firstly reported as *A. glabra* by Castelli *et al*., 2001) encompasses all the southern taxa of *Adenostyles glabra* group, i.e. also *A. australis*, by some authors included in *A. glabra* s.l. (Conti *et al.*, 2005), by others treated as separate species (Bartolucci *et al.*, 2018) or also as a subspecies of *A. alpina* (EURO+MED). For these reasons, we therefore attribute *Laserpitio latifolii-Cirsietum alpis-lunae* to *Adenostylion alpinae* alliance. As to the syntaxonomic order, in accordance with Biondi *et al*. (2014a, 2014b) we prefer to refer to *Adenostyletalia alliariae*, because *Petasito-Chaerophylletalia*, to which *Senecionion samniti* was attributed by Mucina *et al.* (2016), is too strictly linked to humid vegetation of mountain streams of southern Europe. The attribution to *Adenostyletalia alliariae* is reinforced also by the fact that the sites of *Laserpitio latifolii-Cirsietum alpis-lunae* are located in a fully Temperate Oceanic area (Pesaresi *et al*., 2017).

In the end, we want to highlight the conservation relevance of plant communities with *Cirsium alpis-lunae*. As already done for other endemic Tuscan and Italian species (Foggi *et al*., 2015; Orsenigo *et al*., 2016; Fenu *et al*., 2016, 2017) this thistle was already globally assessed with the IUCN methods and found to have a *Near Threatened* (NT) status (Gennai *et al*., 2015). *Laserpitio latifolii-Cirsietum alpis-lunae* conenoses are also important, because they too are strictly endemic and because they can be attributed to a Natura 2000 habitat type of European conservation interest, i.e. cod. 6430 "Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels" (European Commission, 1992, 2013; Biondi & Blasi, 2009). Moreover, the peculiarity of *Laserpitio latifolii-Cirsietum alpis-lunae* conenoses compared with other widespread vegetation types belonging to cod. 6430 confirms that local particular plant communities must be taken into account when assessing the conservation relevance and status of regional territories (Lastrucci *et al*., 2014; Angiolini *et al*., 2017; Gigante *et al*., 2018).

Syntaxonomic scheme (Biondi & Blasi, 2015)

Mulgedio-Aconitetea Hadač & Klika in Klika & Hadač 1944
- *Adenostyletalia alliariae* Br.-Bl. 1931
- *Adenostylenalia alpinae* Biondi & Allegrezza in Biondi, Allegrezza, Casavecchia, Galdenzi, Gasparri, Pesaresi, Vagge & Blasi 2014
  - *Adenostylion alpinae* Castelli et al. ex Castelli, Biondi & Ballelli in Biondi, Allegrezza, Casavecchia, Galdenzi, Gasparri, Pesaresi, Vagge & Blasi 2014
    - *Laserpitio latifolii-Cirsietum alpis-lunae* ass. nova

Other syntaxa quoted in the text (in alphabetic order)
Blysmo-Juncetum depauperatae Bonin 1972
Galio-Urticetea Passarge ex Kopecký 1969
Holoschoenetalia Br.-Bl. ex Tchou 1948
Luzuletum calabrae Bonin 1978
Molinio-Arrhenatheretea Tx. 1937
Molinio-Juncetea Br.-Bl. in Br.-Bl. et al. 1947
Petasito-Chaerophylletalia Morariu 1967
Scheuchzerio palustris-Caricetea fuscae Tx. 1937
Senecionion samniti Bonin 1978
Trifolio-Geranietea Müller 1962

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