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A New *Alnion incanae*-Association of the Inner Italian Alps: *Hedero helici*s-Alnetum glutinosae

By

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With 2 Figures

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Summary

WALLNÖFER S. 2009. A new *Alnion incanae*-association of the inner Italian Alps: *Hedero helici*s-Alnetum glutinosae. – *Phyton* (Horn, Austria) 49 (1): 9–23, with 2 figures.

In this study, the *Hedero helici*s-Alnetum glutinosae (*Alnenion glutinoso-incanae*, *Alnion incanae*) is newly described on the basis of phytosociological relevés. The forest type dominated by black alder is found in the colline and submontane belt on south-facing slopes in the inneralpine, precipitation-poor Vinschgau Valley (South Tyrol, Northern Italy). It colonizes banks of rivulets with shallow to intermediate soil depth. In the understory widespread species of deciduous forests and species of nutrient-rich sites dominate. A tabular comparison with Central European alluvial forest types rich in *Alnus glutinosa* (*Pruno-Fraxinetum*, *Stellario nemorum*-Alnetum glutinosae, *Carici remotae*-*Fraxinetum*) shows clear floristic differences. Differential species of the *Hedero helici*s-Alnetum glutinosae include thermophilous species; it is also negatively differentiated by the absence of species indicating wet soil and of the trees *Fraxinus excelsior* and *Prunus padus*. Also from the association of alluvial black alder forests in Northern and Central Italy (*Aro italici*-Alnetum glutinosae) the *Hedero helici*s-Alnetum glutinosae is clearly distinguished, inter alia by the absence of species preferring wet soils. However, by the dominance of *Hedera helix* it resembles generally the South European alluvial forests. Besides, floristic affinity to Carpinion-communities of Insubria exists. Because of the restricted distribution area

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and the smallness of the stands the *Hedero helici*s-Alnetum glutinosae must be considered as an endangered plant community.

Zusammenfassung

WALLNÖFER S. 2009. A new *Alnion incanae*-association of the inner Italian Alps: *Hedero helici*s-Alnetum glutinosae. [Eine neue *Alnion incanae*-Assoziation der inneren italienischen Alpen: *Hedero helici*s-Alnetum glutinosae]. – *Phyton* (Horn, Austria) 49 (1): 9–23, mit 2 Abbildungen.

In dieser Arbeit wird das *Hedero helici*s-Alnetum glutinosae (*Alnenion glutinoso-incanae*, *Alnion incanae*) auf der Grundlage von pflanzensoziologischen Aufnahmen neu beschrieben. Der von Schwarzerle dominierte, collin-submontane Waldtyp ist auf flach- bis mittelgründigen Bachufern im Bereich südexponierter Hänge im inneralpischen niederschlagsarmen Vinschgau (Südtirol, Norditalien) ausgebildet. Im Unterwuchs herrschen weit verbreitete Laubwaldarten und Arten nährstoffreicher Standorte vor. Der tabellarische Vergleich mit mitteleuropäischen schwarzerlereichen Auwaldgesellschaften (*Pruno-Fraxinetum*, *Stellario nemorum*-Alnetum glutinosae, *Carici remotae*-Fraxinetum) zeigt große floristische Unterschiede auf. Trennarten des *Hedero helici*s-Alnetum glutinosae sind u. a. thermophile Arten, während Pflanzen nasser Böden, aber auch die Baumarten *Fraxinus excelsior* und *Prunus padus* fast vollständig fehlen. Von der Assoziation nord- und mittellitalienischer Schwarzerlenauwälder (*Aro italici*-Alnetum glutinosae) ist das *Hedero helici*s-Alnetum glutinosae ebenfalls deutlich differenziert, u.a. durch den Ausfall von Feuchte- und Nässezeigern. Es ist aber aufgrund der Dominanz von *Hedera helix* generell den südeuropäischen Auwäldern ähnlich. Weiters bestehen floristische Ähnlichkeiten mit insubrischen Carpinion-Gesellschaften. Das *Hedero helici*s-Alnetum glutinosae ist wegen des eng begrenzten Areals und der Kleinflächigkeit der Bestände als gefährdete Waldgesellschaft einzustufen.

1. Introduction

Like other azonal vegetation types, floodplain forests are mainly determined by extreme soil factors and are to a lesser extent influenced by the overall climate. Thus, they usually appear in approximately the same form in several different climatic zones (ELLENBERG 1996). A broad floristic homogeneity was, for example, observed in alluvial *Alnus incana* communities of Northern and Central Europe (SCHWABE 1985).

Alnus glutinosa dominates riparian forest communities throughout its large European range reaching from the Mediterranean to the boreal zone (TCHOU 1948, HORVAT & al. 1974, DIERSCHKE 1980, DIEKMANN 1994, PRIEDITIS 1997, AMIGO & al. 2004). Associations in Central Europe and also in Northern and Central Italy are included in the alliance *Alnion incanae* (Syn. *Alno-Ulmion*) and suballiance *Alnenion glutinoso-incanae* (POTT 1992, PEDROTTI & GAFTA 1996, WILLNER & KARNER 2007). In Central Europe, black alder mainly occurs in the three associations *Pruno-Fraxinetum* OBERD. 1953, *Stellario nemorum*-Alnetum glutinosae LOHMEYER 1957 and *Carici remotae*-Fraxinetum KOCH ex FABER 1936 (NOIRFALISE & DETHIOUX

1980, OBERDORFER 1992, POTT 1992, RENNWALD 2000, WILLNER & KARNER 2007, DOUDA 2008). In Italy, the *Aro italici*-Alnetum glutinosae GAFTA & PEDROTTI 1995 (Syn. "*Alno-Fraxinetum oxycarpae*" sensu auct.) was described within the *Alnion incanae* (FRANCALANCIA & ORSOMANDO 1980, CASINI & al. 1995, PEDROTTI & GAFTA 1996, CESCHIN & SALERNO 2008). All these associations exhibit a widespread distribution which is typical for azonal plant communities.

In the present paper, a new association of riparian *Alnus glutinosa* forest, the *Hedero helici*s-Alnetum glutinosae, is described from the inneralpine Vinschgau Valley in northernmost Italy. It differs remarkably from hitherto known *Alnion incanae* units. It also displays, unlike the above mentioned associations, a very restricted distribution. Floristic composition and habitat of the association are described. Furthermore, issues concerning syntaxonomy, site ecology, distribution and endangerment of the *Hedero helici*s-Alnetum glutinosae are discussed.

2. Study Area

The Vinschgau Valley (= Valle Venosta, South Tyrol) in northernmost Italy is an over 75 km long, west-east directed valley running parallel to the Ötztal Alps in the north and the Ortler Alps in the south. The broad U-shaped main valley has very steep slopes. The study area comprises the south facing slope of the Vinschgau Valley, called Sonnenberg (46° 36'–46° 42' N, 10° 33'–11° 03' E; Fig. 1). Most relevés were made in the eastern part of the valley. The studied sites lie mainly in the colline and submontane altitudinal belt (600–1280 m a.s.l.).

Geologically the study area is situated in the so-called "schistic zone" of the Vinschgau Valley, a part of the Ötztal-Stubai complex. The bedrock consists mainly of gneisses and phyllites. The dominating soil types are mostly base-rich pararendzina, brunificated pararendzina and brunificated ranker (STAFFLER & al. 2003).

The study area has a Central European climate with mean annual temperatures of 9–10° C (FLIRI 1975). Due to the inner-alpine position characterized by orographic seclusion, the Vinschgau Valley is the driest and most continental region of the Eastern Alps (FREI & SCHÄR 1998). Annual precipitation rates in the colline and submontane belt are about 490–550 mm with a peak in July and August. Air humidity is low. Frequent winds from West or North additionally contribute to the dryness. On the south-facing slope of the valley, the microclimate is characterized by exceptional drought and summer heat. The sample plots, however, are situated in narrow and deep valleys with a clearly more shaded and humid microclimate compared to the surrounding slopes. Microclimate data are not available.

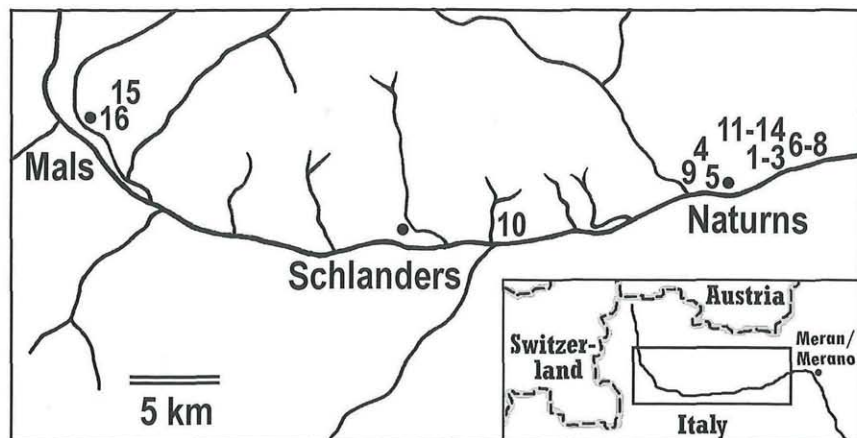


Fig. 1. Map of the study area showing the approximate location of relevé sites. Relevé numbers correspond with numbers in Tab. 1.

Characteristic vegetation in the colline and submontane belt of the Sonnenberg consists of open *Quercus pubescens* woodland with *Fraxinus ornus*, *Pinus sylvestris* and *Larix decidua* admixed (BRAUN-BLANQUET 1961, STAFFLER & KARRER 2001). The forests are intermingled with patches of shrub communities and dry grassland. In part they are occurring naturally, in part they result from pasture (STRIMMER 1974, SCHWABE & KRATOCHWIL 2004). Large areas are covered by plantations of *Pinus nigra*. In general, the area has been subjected to a long-lasting human influence, especially from pasture. The studied sites, however, are only influenced by infrequent coppicing and grazing.

3. Methods

Vegetation was recorded from 2003 till 2007 according to the Braun-Blanquet method (WESTHOFF & VAN DER MAAREL 1978). Sampling areas were adapted to the narrow strip-formed stands. Plot size ranges from 80 to 150 sqm. Fieldwork was done in early summer in order to record also geophytes. The cover-abundance scale follows REICHELTE & WILMANNS 1973. The vegetation table was sorted manually. Nomenclature of phanerogams follows WILHALM & al. 2006; the nomenclature of mosses follows FREY & al. 2006. Information on ecological and sociological behaviour of species derives from OBERDORFER 2001 and MUCINA & al. 1993. The association concept applied is in accordance with WILLNER 2006 and WILLNER 2007; it admits the description of associations based on good differential species. The denomination of syntaxa is in accordance with WEBER & al. 2000. Syntaxonomy follows WILLNER & KARNER 2007 and PEDROTTI & GAFTA 1996.

Tab. 1 displays the original relevés and, in addition, a comparison with published tables of four similar associations of the suballiance *Alnenion glutinoso-incanae*: (i) *Pruno-Fraxinetum* developed in depressions and valley bottoms on deep,

moist soils with high water table. This widespread Central European community was also recorded on the bottom of Vinschgau Valley (PEER 1977, MÜLLER 1997). (ii) *Stellario nemorum*-*Alnetum glutinosae* found on temporarily flooded banks of rapidly flowing streams on siliceous rock up to the montane belt. It was recorded in North-eastern Austria and in Northern Bavaria (WALENTOWSKI & al. 2004, WILLNER & KARNER 2007). (iii) *Carici remotae*-*Fraxinetum*, growing on constantly percolated soils next to springs and rivulets. The association is widespread in Austria, Bavaria and Switzerland (ELLENBERG & KLÖTZLI 1974, WALENTOWSKI & al. 2004, WILLNER & KARNER 2007). (iv) *Aro italici*-*Alnetum glutinosae*, comprising riparian forests on wet soils in Northern and Central Italy (GAFTA & PEDROTTI 1995, PEDROTTI & GAFTA 1996).

The average ecological indicator value of soil moisture was calculated for the here discussed units except for the *Aro italici*-*Alnetum glutinosae*. Values were taken from ELLENBERG & al. 1991. As they were defined for Central Europe north of the Alps, the results should be interpreted with caution. In addition, some of the species lists used for the calculation are incomplete.

4. Results

The *Hedero helici*s-*Alnetum glutinosae* is here newly described and recorded in Tab. 1. Holotypus of the association is relevé no. 6 in Tab. 1. The UTM coordinates of this relevé are 32T 655060 E 5170140 N.

4.1. Structure and Floristic Composition

The forest stands form narrow stripes along the rivulets. The 15–20 m high canopy is mostly gappy. Also the shrub layer is moderately developed. The herb layer cover is variable, amounting from 25 to 70 %. Mosses cover up to 20 % of the plot area.

The tree layer is clearly dominated by *Alnus glutinosa*. *Fraxinus ornus* is admixed throughout, but grows only in rarely flooded, relatively dry zones of the plots. Less frequent are *Prunus avium*, *Alnus incana*, *Juglans regia*, *Populus nigra* and *Castanea sativa*. The shrub layer is mainly built up by *Sambucus nigra*, *Corylus avellana* and juvenile trees. In addition, climbing *Hedera helix* is often present in shrub and tree layers. In the herb layer the most important species are *Brachypodium sylvaticum*, *Hedera helix*, *Salvia glutinosa*, *Parietaria officinalis*, *Stachys sylvatica*, *Equisetum arvense*, *Athyrium filix-femina* and *Oxalis acetosella*. Most of them are character species of the units *Fagetalia sylvaticae* or *Querco-Fagetea*. They typically occur on sites with good water supply, but not on wet soils (OBERDORFER 2001). Besides, some species typical for floodplain forest indicate moist to wet, nutrient-rich soils (e.g., *Stachys sylvatica*, *Circaea lutetiana*). Some of the species such as *Parietaria officinalis*, *Geranium robertianum* and *Urtica dioica* are principally characteristic for nutrient-rich ruderal communities. The most frequent bryophytes are *Plagiomnium undulatum*, *Conocephalum conicum* and *Brachythecium rivulare*.

Table 1 (continued)

Column no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
<i>Hieracium murorum</i>	-	-	-	+	-	-	+	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-
<i>Deschampsia cespitosa</i>	-	-	-	-	+	-	-	-	1	+	-	+	-	-	+	1	98	6	21	23	20	52	68	-	-
<i>Rubus caesius</i>	-	-	-	-	+	-	-	-	-	+	-	-	-	+	-	1	91	83	13	23	34	16	-	3	59
<i>Angelica sylvestris</i>	-	-	-	-	-	+	1	-	1	-	-	-	+	-	1	1	82	-	8	12	11	18	10	+	41
<i>Aethusa cynapium</i>	r	-	+	-	+	-	-	-	-	+	+	+	-	+	-	-	-	-	-	-	-	-	-	-	17
<i>Poa nemoralis</i>	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	2	-	8	35	9	6	-	+	12
<i>Rosa canina</i>	-	+	-	-	+	+	+	+	+	+	+	+	+	+	+	-	51	-	-	3	-	-	+	-	-
<i>Myosotis sylvatica</i> agg.	-	-	+	+	-	-	-	-	-	-	-	1	+	+	-	-	-	-	-	1	-	-	-	-	12
<i>Carex pallescens</i>	+	+	-	-	+	-	-	+	-	-	+	-	+	-	-	-	61	-	-	-	1	-	-	-	-
Bryophytes																									
<i>Plagiomnium undulatum</i>	-	+	+	2a	+	-	1	1	-	-	+	+	-	1	+	+	-	-	-	-	-	-	-	-	-
<i>Conocephalum conicum</i>	+	-	-	1	-	+	1	1	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Brachythecium rivulare</i>	-	+	1	-	1	-	-	-	-	1	-	+	+	-	+	1	-	-	-	-	-	-	-	-	-
<i>Atrichum undulatum</i>	-	+	-	+	+	-	-	-	1	-	+	-	-	+	1	-	-	-	-	-	-	-	-	-	-
<i>Eurhynchium angustifolium</i>	-	-	-	+	+	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Plagiomnium rostratum</i>	-	-	-	-	-	-	-	+	1	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-

Rare species: *Agrostis* sp. 8, 13+; *A. stolonifera* 4+; *Ajuga reptans* 13+; *Allium* sp. 2, 3, 4, 7, 9+; *Alnus incana* juv. 10:1, *Arctium* sp. 8+; 3+; *Artemisia absinthium* 14+; *Artemisia vulgaris* 16+; *Aruncus dioicus* 9, 12+; *Astragalus glycyphyllos* 11+; *Betula pendula* 7:1, *B. pendula* juv. 3, 4, 10+; *Bromus ramosus* 12+; *Bryonia dioica* 15+; *Bryum bimum* 9:1, *Cardamine amara* 4, 9, 16+; *Carex digitata* 12+; *C. hirta* 1, 14+; *C. humilis* 11+; *C. spicata* 7+; *Celtis australis* 5+; 2, 13+; *Cerastium holosteoides* 6+; *Chaerophyllum aureum* 16+; *Chelidonium majus* 6+; *Cirsium oleraceum* 1, 13, 14+; 5+; *C. palustre* 15+; *C. vulgare* 15+; 8+; *Clinopodium vulgare* 13+; *Crepis paludosa* 4+; *Dactylis glomerata* 4, 13+; *Dactylorhiza maculata* agg. 14+; 13+; *Dryopteris affinis* 7+; *Dryopteris carthusiana* 10+; *Epilobium montanum* 15+; *Epipactis helleborine* 7+; *E. sp.* 11+; *Equisetum variegatum* 10+; *Erigeron annuus* 9+; *Euonymus europaeus* 5, 9, 13+; 12+; *Fallopia convolvulus* 6, 12, 13+; 8+; *Festuca arundinacea* 4, 7, 8+; *F. gigantea* 14+; *F. nigricans* 4:2a; 7+; *F. sp.* 8+; *Galeopsis* sp. 3, 6+; *G. tetrahit* 11+; *Gymnocarpium dryopteris* 14+; *Hieracium sphondylium* 7+; *Hieracium bifidum* 14+; *H. laevigatum* 8+; *H. sp.* 11, 13+; *Hippocrepis emerus* 8+; *Holcus lanatus* 4, 7+; *Hypericum tetrapterum* 7, 9+; *Juncus compressus* 1+; *J. effusus* 9+; *Juniperus communis* 4, 10+; *Larix decidua* 11+; *Listera ovata* 5, 9+; *Lycopodium europaeum* 2+; *Lythrum salicaria* 4, 5+; 9:1, *Melica nutans* 10:1, *Mentha* sp. 1, 2, 4, 5, 9, 11+; *Ophioglossum vulgatum* 8+; *Palustriella commutata* 10+; *Peucedanum oreoselinum* 4+; *Phegopteris connectilis* 14+; *Phyteuma betonicifolium* 4, 8, 14, 15+; *Picea abies* 7, 15:1, *P. abies* juv. 10, 16+; *Pimpinella major* 5+; 11+; *Plagiomnium affine* 9+; *Plagiomnium medium* 5+; 9:1, *Plagiothecium succulentum* 4+; *Poa angustifolia* 5+; *P. sp.* 4:1, *P. trivialis* 6, 8, 9+; *Polydium vulgare* 7+; *Populus tremula* 4:1; 12+; *P. tremula* juv. 4, 12+; *Primula veris* 1, 11+; 5+; *Prunella vulgaris* 11+; 4+; *Pteridium aquilinum* 6:1; 12+; *Rhamnus cathartica* 15, 16+; 13+; *Rosa* sp. 4, 9, 11+; *Rubus corylifolius* agg. 11:1, *R. idaeus* 15, 16+; 11:1, *Sambucus racemosa* 10:1, *Scrophularia nodosa* 11+; *Silene latifolia* 16+; *Solidago virgaurea* 15+; *Sorbus aucuparia* juv. 15, 16+; *Stellaria media* 14+; *Tilia cordata* 10:1, *T. cordata* juv. 10+; *Torilis japonica* 7, 8, 13, 14+; 5, 6+; *Ulmus glabra* 16:2b; 10:2a, *U. glabra* juv. 16:1; 2, 10, 15+; *U. minor* 6:1, *U. minor* juv. 5, 6, 9, 13+; *Valeriana officinalis* s.l. 10, 15, 16+; *V. tripteris* 15+; *Veronica beccabunga* 15+; *V. chamaedrys* 12, 13:1; 4+; *V. hederifolia* agg. 12+; *Viburnum opulus* 5+; *Vincetoxicum hircundinaria* 4+; *Viola odorata* 5+.

The species composition of the relevés is homogenous, a division into subassociations is not apparent. Relevés no. 15 and 16, however, were made on the margins of the study area in the western Vinschgau Valley at a rather high altitude. Accordingly they show some divergences, e.g. the minor importance of *Hedera helix* and the presence of *Fraxinus excelsior*.

The syntaxonomical comparison with similar associations described in the literature yields a clear differentiation of the *Hedero helici*-Alnetum glutinosae (Tab. 1). The most resembling units are the South Tyrolean and Pannonian form of *Pruno-Fraxinetum* (PF1, PF2) and *Aro italici*-Alnetum glutinosae (AA1, AA2). The differential species of the *Hedero helici*-Alnetum glutinosae include:

1) Thermophilous, partially frost-susceptible species, many of them with submediterranean distribution. These are woody plants (*Fraxinus ornus*, *Juglans regia*, *Castanea sativa*, *Prunus mahaleb*, *Hedera helix*) as well as herbaceous species (*Festuca heterophylla*, *Brachypodium rupestre*).

2) Fern species typically growing in rock crevices (*Asplenium trichomanes*, *Cystopteris fragilis*, *Asplenium adiantum-nigrum*).

3) Pioneer or ruderal species (*Arctium minus* agg., *Tussilago farfara*).

In addition, the *Hedero heliis-Alnetum glutinosae* is negatively differentiated by the absence of many species. These are mainly character species of the order Fagetalia (e.g., *Fraxinus excelsior*, *Impatiens noli-tangere*, *Ficaria verna*, *Galeobdolon luteum* agg.), of wet meadows (e.g., *Filipendula ulmaria*, *Caltha palustris*, *Lysimachia vulgaris*) and of wet forest communities (e.g., *Festuca gigantea*, *Carduus personata*, *Carex pendula*). The comparison of average indicator values of soil moisture in Tab. 1 shows that the value of the *Hedero heliis-Alnetum glutinosae* is the lowest.

4.2. Syntaxonomical Status

We assign the *Hedero heliis-Alnetum glutinosae* to the class *Querco-Fagetea* BR.-BL. & VIEGIER 1937, order *Fagetalia sylvaticae* PAWL. 1928, alliance *Alnion incanae* PAWL. 1928 and suballiance *Alnenion glutinoso-incanae* OBERD. 1953 (WILLNER & KARNER 2007). The attribution to Fagetalia is well-founded as species of Central European deciduous forests make up the largest part of species. The affinity to the alliance and suballiance of riparian alder forests is above all based on the dominance of *Alnus glutinosa* and habitat characteristics. In the herb layer, however, character species of *Alnion incanae* are of little importance (e.g., *Stachys sylvatica*, *Circaea lutetiana*).

4.3. Habitat

The sample plots are situated in 5–15 m wide, often deeply indented brook valleys (Fig. 2). The microclimate of the forested, shady valleys is relatively cool and humid compared to the surrounding area. However, the southerly exposure on a large scale leads to generally high temperatures.

The streams are mostly small and, due to the strong inclination, rapidly flowing. The forest stands grow in areas from 0 to 1.5 m above the stream level. The incline of the banks is varying, but often quite steep. Accordingly, the action of running water and the water supply in the upper soil layers are considerably varying within a sample plot. The banks of the streamlets are strongly affected by the eroding action of the rapidly flowing water. In contrast, areas further away from the stream are only rarely flooded. The main soil type is brown soil. Soils are skeleton-rich and exhibit high loam

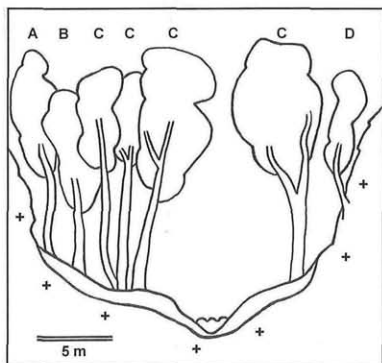


Fig. 2. View of a typical stand of *Hedero heliis-Alnetum glutinosae*. The crosses mark solid rock. Symbols for tree species: A – *Fraxinus ornus*, B – *Juglans regia*, C – *Alnus glutinosa*, D – *Quercus pubescens*.

contents. Nitrogen content of the soil is presumably high owing to the impact of the symbiosis of alder with bacteria of the genus *Frankia* (*Actinomyces*). Soil depth is low to moderate and varying within the sites. In general it doesn't exceed 60 cm. In this depth usually solid rock is reached. Consequently, also the waterlogged soil zone beneath and lateral to the streambed, belonging to the hyporheic zone and/or the groundwater zone, is very narrow.

5. Discussion

5.1. Syntaxonomy and Site Ecology

The *Hedero helici*-*Alnetum glutinosae* exhibits substantial floristic differences from the most similar Central European units, although these were recorded not far from the study area, in the Vinschgau valley and in adjacent Austria. The following features are evident:

1. The *Hedero helici*-*Alnetum glutinosae* comprises only few species indicating moist and wet soils. This is also shown by the low ecological indicator value of soil moisture. Obvious reasons for this are the limited influence of surface water and groundwater within the stands. Presumably also climate, i.e. high temperatures and drought, could be relevant. Owing to its rather dry character the *Hedero helici*-*Alnetum glutinosae* shows a certain resemblance to stands of no longer flooded, former alluvial forest. This applies for example to dry floodplain forests in Eastern Switzerland ("Ulmo-Fraxinetum impatientetosum", FREY 1995); dominating species of that unit are *Alnus glutinosa* and *Fraxinus excelsior* in the tree layer and *Impatiens parviflora*, *Glechoma hederacea*, *Circaea lutetiana*, *Geum urbanum* and *Brachypodium sylvaticum* in the herb layer.

2. Remarkable is the almost complete absence of *Fraxinus excelsior* and *Prunus padus*, which do occur in the Vinschgau Valley (WILHALM & al. 2006). Both are constant and diagnostic species of the *Alnion incanae* (OBERDORFER 1992, CHYTRÝ & TICHÝ 2003, WILLNER & KARNER 2007). Also in this case a probable explanation is the rather dry soil character and the lacking contact to a larger groundwater body. However, the absence of *Fraxinus excelsior* is striking as this species tolerates also strong water deficit (MARIGO & al. 2000).

3. The *Hedero helici*-*Alnetum glutinosae* contains a very small number of geophytes, whereas this life form occurs frequently in the *Pruno-Fraxinetum*, *Stellario nemorum*-*Alnetum* and *Carici remotae*-*Fraxinetum* (e.g., *Ficaria verna*, *Anemone nemorosa*, *Allium ursinum*; Tab. 1). High frequency and dominance of geophytes are generally characteristic for Central European floodplain forests (ELLENBERG 1996). This is also the case in warm regions in Central Europe (e.g. South-eastern pannonian Austria; see unit PF2 in Tab. 1; KARRER & KILIAN 1990).

The distinction from the Aro italici-Alnetum glutinosae is mainly based on other differential species (Tab. 1). Essential is the comparison with the nomenclatural type of the association by GAFTA & PEDROTTI 1995 (unit AA1 in Tab. 1). In addition, Tab. 1 contains data of anthropogenically altered, coppiced stands of the association from a regional study (FRANCALANCIA & MARCONI 1994; unit AA2).

The above mentioned points apply in part to the comparison between Hedero helici-Alnetum glutinosae and Aro italici-Alnetum glutinosae. Firstly, also the Aro italici-Alnetum glutinosae has several differential species which indicate soil moisture (e.g., *Festuca gigantea*, *Carex pendula*, *Ranunculus lanuginosus*, *Carduus personata*). As to the above mentioned point 2, in the here displayed data of the Aro italici-Alnetum glutinosae *Fraxinus excelsior* and *Prunus padus* do not occur, but they can be found in other Alnion incanae units in Northern and Central Italy (PEDROTTI & GAFTA 1996). Finally, geophytes are frequent also in the Aro italici-Alnetum glutinosae (e.g., *Arum italicum*, *Cardamine bulbifera*).

Altogether, the data by FRANCALANCIA & MARCONI 1994 show a moderate resemblance with the Hedero helici-Alnetum glutinosae (Tab. 1). They include some of its differential species, e.g., *Hedera helix*, *Prunus avium*, *Lapsana communis* and *Salvia glutinosa*. A broad syntaxonomical overview on South European riparian forests by DIERSCHKE 1980 reveals that *Hedera helix*, a dominant species in the Hedero helici-Alnetum glutinosae, is a constant species in many of these forests types. There exists also a study on *Alnus incana* forests of Europe showing an increased occurrence of *Hedera helix* in communities of the Southern and South-western Alps (SCHWABE 1985).

Thus, a floristical affinity of the Hedero helici-Alnetum glutinosae with South European floodplain forests can be stated. Considering possible reasons for the formation of this association, this resemblance may point out the relevance of the dry and warm climatic conditions in the study area. Temperature has also been shown to be the most important factor for the variability of Alnion incanae communities in the Czech Republic (DOUDA 2008). Besides, a decisive factor for the development of the Hedero helici-Alnetum glutinosae could also be the regional absence of competing tree species: In adjacent, less continental parts of South Tyrol *Ostrya carpinifolia* dominates forests in small valleys and ravines in the colline and submontane belt, whereas in the study area it is absent for climatical reasons (PEER 1982).

Aside from that, the Hedero helici-Alnetum glutinosae shows certain floristical and ecological relations to Carpinion betuli units. An example is a submontane forest community dominated by *Castanea sativa*, *Fraxinus excelsior* and *Alnus glutinosa*, which is developed in insubrian, precipitation-rich Southern Switzerland (ANTONIETTI 1968: "Querco-Fraxinetum prov.", ELLENBERG & KLÖTZLI 1974: "Arunco-Fraxinetum castanosum").

Those sites are slopes on base-rich silicate bedrock with moist, nutrient-rich soils. Floristic similarity with the *Hedero helcis*-*Alnetum glutinosae* is expressed by the frequent occurrence of *Alnus glutinosa*, *Castanea sativa*, *Rubus fruticosus* agg., *Athyrium filix-femina*, *Salvia glutinosa*, *Hedera helix* and *Festuca heterophylla* (ELLENBERG & KLÖTZLI 1974). However, the Swiss stands are clearly differentiated by species revealing a higher water supply and a lower pH-value of the soil (e.g., *Fraxinus excelsior*, *Frangula alnus*, *Aruncus dioicus*, *Molinia arundinacea*, *Pteridium aquilinum*, *Vaccinium myrtillus*). In view of the huge climatic difference of the two regions, the floristic resemblance of both forest types seems striking and points out the relatively humid and cool microclimate of the *Hedero helcis*-*Alnetum glutinosae* stands.

5.2. Endangerment and Conservation

Generally the *Hedero helcis*-*Alnetum glutinosae* can be considered as a very rare community, as only few streamlets are found in the study area. This forest type is of high conservation value. It corresponds to the priority natural habitat type "91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)" according to Annex I of the flora-fauna-habitat directive of EU (LASÉN & WILHALM 2004). The community considerably contributes to the floristic diversity of the region, as it is rich in species with suboceanic distribution and contains several regionally rare taxa (e.g., *Ophioglossum vulgatum*).

However, the stands are threatened by a potential reduction of the streams' water flow, as black alder relies on a continuous, good water supply (WALENTOWSKI & EWALD 2003). In contrast to other alluvial sites, the trees do not reach a groundwater body that is independent of the stream water. In dry stream beds within the study area, dead individuals of black alder can be found. A reduction of water flow can be expected in the course of upcoming climate change, among others because of increasing water demand by agriculture.

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