

Description and validation of some European forest syntaxa – a supplement to the EuroVegChecklist

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Ključne besede: *Abietetalia sibiricae*, *Asaro europaei-Abietetea sibiricae*, *Betulo pendulae-Populetales tremulae*, *Carpino-Fagetea*, *Quercetea ilicis*, *Quercetea pubescentis*, *Quercetea robori-sessiliflorae*, gorovje Ural, *Vaccinio-Piceetea*.

Abstract

In this paper we present nomenclatural adjustments and validations of syntaxa of the forest vegetation of Europe. We introduce a new, valid name of the class of nemoral coniferous or mixed forests (*Asaro europaei-Abietetea sibiricae*) replacing the deciduous *Carpino-Fagetea* in the easternmost Europe and Siberia. We describe two new orders for birch and birch-poplar woodlands, formerly included in the *Betulo pendulae-Populetales tremulae*. We validate the names of two alliances for the deciduous forests of the Southern Urals and the name of an alliance for hemiboreal forest swamps. The suballiance *Ostryo-Tilienion*, coined to accommodate the xerothermophilous ravine forests of SE Europe, is here elevated to the rank of alliance. Finally, we validate the name *Quercion alnifoliae* (evergreen oak forests of Cyprus).

Izveček

V članku predstavljamo nomenklaturne prilagoditve in potrditve gozdnih sintaksonov Evrope. Predstavljamo novo veljavno ime razreda iglastih ali mešanih gozdov (*Asaro europaei-Abietetea sibiricae*), ki nadomešča listopadne gozdove razreda *Carpino-Fagetea* v najbolj vzhodnih delih Evrope in v Sibiriji. Opisali smo dva nova reda brezovih in brezovo-topolovih gozdov, ki sta bila prej vključena v red *Betulo pendulae-Populetales tremulae*. Veljavno smo opisali dve zvezi listopadnih gozdov v južnem Uralu in poimenovali zvezo hemiborealnih močvirnih gozdov. Podzvezo *Ostryo-Tilienion*, kamor uvrščamo kserotermofilne gozdove plementih listavcev jugovzhodne Evrope, smo povzdignili na nivo zveze. Nazadnje smo veljavno opisali zvezo *Quercion alnifoliae* (vednozeleni hrastovi gozdovi na Cipru).

Abbreviation and nomenclature: ICPN – International Code of Phytosociological Nomenclature, 3rd ed. (Weber et al. 2000); nomenclature of plant species follows Euro+Med PlantBase (www.emplantbase.org, last accessed on 26 Jan 2015). In cases where the taxa are not covered by the Euro+Med checklist, we use the latest taxonomic and nomenclatural sources as implemented in the EuroVegChecklist (Mucina et al., submitted).

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Introduction

This paper is part of a series of contributions accompanying the publication ‘*Vegetation of Europe: Hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algae communities*’ (Mucina et al. submitted; hereafter referred to as ‘EuroVegChecklist’). During the preparation of this checklist, it became apparent that for several syntaxa no valid or legitimate names according to the International Code of Phytosociological Nomenclature (Weber et al. 2000; ICPN hereafter) were available. In exceptional cases it was also necessary to establish new high-ranked units to increase the coherence of the classification scheme.

In the present paper, we describe and validate forest syntaxa belonging to the classes *Quercetea robori-sessiliflorae*, *Quercetea pubescentis*, *Carpino-Fageteta*, *Quercetea ilicis* and *Vaccinio-Piceetea*. We also introduce a new, valid name of the class of nemoral coniferous or mixed forests replacing the deciduous *Carpino-Fageteta* in the easternmost Europe and Siberia. The presentations of the syntaxa are the responsibility of the authors named in the respective subheadings. When quoting them, please cite ‘<author(s)> in Willner et al. 2016’.

Description and validation of syntaxa

Acidophilous atlantic birch woodlands of Western and Southern Europe

(by W. Willner & L. Mucina)

The birch woodlands (*Betulion fontquerio-celtibericae* Rivas-Martínez et Costa 2002 and *Lonicero periclymeni-Betulion pubescentis* Géhu 2006) of the Atlantic region of Europe have been classified within the *Betulo pendulae-Populetalia tremulae* Rivas-Martínez et Costa 2002 (see Rivas-Martínez et al. 2002, Géhu 2006). However, we consider the concept of this order as being too heterogeneous in terms of biogeography, ecology, and also of species composition. The atlantic birch woodlands are usually dominated by *Betula pubescens* s. l. (including *B. celtiberica*) and neither by *Betula pendula* s. l. (including *B. fontqueri*) nor *Populus tremula* that are diagnostic for the temperate deciduous birch-poplar woodlands on mineral soils (see below). They also cannot be included in the *Quercetalia roboris* because the latter represent the

zonal oak forests on nutrient-poor acidic soils of Europe while the birch woodlands are considered successional stages replacing oak forests after disturbance or permanent communities in frequently disturbed habitats, such as avalanche channels. Therefore, we establish a new order for the acidophilous birch communities of the Atlantic region:

***Lonicero periclymeni-Betuletalia pubescentis* Willner et Mucina ord. nov. hoc loco**

(*Quercetea robori-sessiliflorae*)

Holotypus hoc loco: Lonicero periclymeni-Betulion pubescentis Géhu 2006 (Géhu 2006: 299)

Diagnostic taxa: *Betula pubescens* (incl. *B. celtiberica*), *Blechnum spicant*, *Dryopteris dilatata*, *Lonicera periclymenum*, *Osmunda regalis*, *Pteridium aquilinum*

We classify this order in the *Quercetea robori-sessiliflorae*. However, it also shows affinities to the birch woodlands on mesotrophic mires (*Salici pentandrae-Betuletalia pubescentis* Clausnitzer in Dengler et al. 2004 and *Molinio-Betuletalia pubescentis* Passarge 1968) that are classified in the *Alnetea glutinosae* in the EuroVegChecklist. If the dominant species of the tree layer is given a higher weight in the classification, the latter two orders could be combined with the *Lonicero periclymeni-Betuletalia pubescentis* into the *Molinio-Betuletea pubescentis* Passarge 1968 (in case this class would be considered a viable syntaxonomic concept). A large-scale syntaxonomic revision is needed to evaluate the merits of these two alternative class concepts.

Temperate deciduous birch-poplar woodlands on mineral soils of Europe

(by W. Willner & L. Mucina)

This unit comprises natural pioneer and secondary birch-poplar woodlands on mineral soils in the temperate zone of Europe. Rivas-Martínez et al. (2002) included these woodlands in the *Betulo pendulae-Populetalia tremulae* Rivas-Martínez et Costa 2002. However, the type alliance of this order, the *Corylo-Populion tremulae* (Br.-Bl. ex O. de Bolòs 1973) Rivas-Martínez et Costa 1998, is based on the *Hepatico-Coryletum* Br.-Bl. 1952. In the EuroVeg-Checklist hazel scrubs are excluded from this unit and classified within the *Crataego-Prunetea* Tx. 1962. Therefore, it seems necessary to establish a new name for the alliance and for the order of the mesic birch-poplar woodlands. Unfortunately, only few associations corresponding

to this vegetation type have been formally described so far (e.g., De Bolòs 1979) and a large-scale comparison is completely missing. Therefore, we refrain from a formal description of the higher syntaxa until more data from different parts of Europe have been gathered.

Fragario vescae*-*Populetales tremulae* Willner et Mucina *ordo nov. prov.

(*Brachypodio pinnati*-*Betuletea pendulae*)

Diagnostic species: *Betula pendula*, *Populus tremula*, *Salix caprea*

The tree species composition of this provisional order resembles the forests that dominated large parts of temperate Europe in the early Holocene, before the *Carpino-Fagetes* species returned from their glacial refugia. Similar woodlands can still be found in the hemiboreal zone of the Southern Urals and Southern Siberia (Ermakov et al. 2000; Chytrý et al. 2010). Therefore, the *Fragario vescae*-*Populetales tremulae* should be classified within the *Brachypodio pinnati*-*Betuletea pendulae* Ermakov et al. 1991, a class originally described from Southern Siberia (Ermakov et al. 2000).

Thermophilous oak woodlands of the Southern Urals

(by A. Solomeshch)

Lathyro pisiformis*-*Quercion roboris* Solomeshch et Grigoriev *all. nov. hoc loco

(*Quercetalia pubescenti-petraeae*, *Quercetea pubescentis*)

Synonyms: *Lathyro pisiformis*-*Quercion roboris* Solomeshch et al. 1989 (ICPN art. 1); *Pruno-Quercion roboris* Schubert et al. 1979 (ICPN art. 5)

Holotypus hoc loco: *Brachypodio pinnati*-*Quercetum roboris* Solomeshch et Grigoriev in Willner et al. 2016 (see below)

Diagnostic taxa: Trees & shrubs: *Quercus robur*, *Caragana frutex*, *Rosa majalis*; Herbs and graminoids: *Aconitum anthora*, *Carex pediformis* subsp. *macroura*, *Digitalis grandiflora*, *Geranium pseudosibiricum*, *G. sylvaticum*, *Heracleum sphondylium* subsp. *sibiricum*, *Hieracium pseuderectum*, *Lathyrus gmelinii*, *Lathyrus rotundifolius*, *L. pisiformis*, *L. sylvestris*, *Pleurospermum uralense*, *Seseli libanotis*, *Vicia sepium*

The *Lathyro pisiformis*-*Quercion roboris* comprises thermophilous continental oak woodlands on the very eastern border of the *Quercus robur* distribution in the

Southern Urals, close to the border between the Eastern Europe and the Western Siberia. They occur in the forest-steppe zone on fertile dark grey soils over calcareous substrate and often are surrounded by steppe vegetation. These woodlands are floristically rich and contain in the ground layer thermophilous species such as *Brachypodium pinnatum*, *Campanula bononiensis*, *Clinopodium vulgare*, *Filipendula vulgaris*, *Inula hirta*, *I. salicina*, *Nepeta pannonica*, *Origanum vulgare*, *Phlomis tuberosa*, *Polygonatum odoratum*, *Tanacetum corymbosum*, *Stachys officinalis*, *Vincetoxicum hirundinaria* and *Viola hirta*, which differentiate these forest from the mesophilous forests of the *Carpinetalia betuli* P. Fukarek 1968 (class *Carpino-Fagetes*). These species are considered as diagnostic for the *Quercetalia pubescenti-petraeae* Klika 1933 (Zólyomi 1957; Chytrý 1997). However, the Southern Urals oak woodlands are not typical of this order because of their distribution far outside the ranges of *Quercus pubescens* and *Q. petraea* and because of the absence of many species typical of the *Quercetalia pubescenti-petraeae*, such as *Crataegus laevigata*, *Sorbus torminalis*, *Viburnum lanata*, *Dictamnus albus*, *Ligustrum vulgare* and *Melittis melisophyllum*. The most similar alliance is the *Aceri tatarici-Quercion* Zólyomi 1957 (see Bulokhov & Solomeshch 2003). Towards the East, these oak woodlands give way to the Siberian forests of the hemi-boreal *Brachypodio pinnati*-*Betuletea pendulae* that can be floristically similar in the ground layer. However, in the canopy of the hemi-boreal forests, *Quercus robur* is replaced by *Pinus sylvestris*, *Betula pendula* and *Larix sibirica* (Ermakov et al. 1991; Solomeshch et al. 2002).

The *Lathyro pisiformis*-*Quercion roboris* includes half a dozen associations described in a manuscript registered in the Soviet Union Institute of Scientific and Technical Information (VINITI; Solomeshch et al. 1989a). Other associations of this alliance were published by Solomeshch et al. (1994), Martynenko et al. (2005, 2008a, 2008b) and Shirokikh et al. (2010). This alliance has not been validated so far since the VINITI manuscripts (incl. Solomeshch et al. 1989a) were (erroneously) considered as effective publication by some Russian phytosociologists. Here we validate the alliance and one of its associations:

Brachypodio pinnati*-*Quercetum roboris* Solomeshch et Grigoriev *ass. nov. hoc loco

(*Lathyro pisiformis*-*Quercion roboris*, *Quercetalia pubescenti-petraeae*)

Holotypus (hoc loco) of the association: Russian Federation, Bashkortostan Republic, Kugarchinskiy District, 5 km NE from the village Nizhnebikkuzino. Coordi-

notes: 52°59'18.2" N, 56°34'15.3" E. Field code: 101. Habitat: mountain ridge slope, close to the top of the ridge. Relevé area: 300 m², Aspect: East; Cover of tree layer: 70%; Cover of shrub layer: 7%; Cover of herb layer: 75%; Cover of moss layer: 0%; Average height of trees: 10 m; Average diameter of tree trunks: 30 cm. Species cover-abundance values are given in the modified Braun-Blanquet scale. Also published in Shirokikh et al. (2010: 336–344, Table 36, rel. 7). Author of the relevé: Ayzik Solomeshch.

Tree layer: *Quercus robur* 5, *Acer platanoides* 1, *Quercus robur* 1, *Ulmus glabra* +, *Betula pendula* r, *Sorbus aucuparia* r, *Tilia cordata* r.

Shrub layer: *Caragana frutex* 1, *Cytisus ruthenicus* 1, *Euonymus verrucosa* +, *Rosa majalis* +, *Prunus fruticosa* +, *Rhamnus cathartica* r, *Viburnum opulus* r.

Herb layer: *Aegopodium podagraria* 2b, *Brachypodium pinnatum* 2b, *Rubus saxatilis* 2b, *Phlomis tuberosa* 1, *Quercus robur* juv. +, *Aconogonon alpinum* +, *Adenophora liliifolia* +, *Agrimonia eupatoria* subsp. *asiatica* +, *Artemisia armeniaca* +, *Artemisia vulgaris* +, *Bistorta officinalis* +, *Calamagrostis arundinacea* +, *C. epigejos* +, *Campanula bononiensis* +, *Carex praecox* +, *Crepis sibirica* +, *Dactylis glomerata* +, *Delphinium dictyocarpum* +, *Digitalis grandiflora* +, *Euphorbia semivillosa* +, *Filipendula vulgaris* +, *Fragaria viridis* +, *Galatella sedifolia* subsp. *biflora* +, *Galium boreale* +, *G. ruthenicum* +, *Geranium pseudosibiricum* +, *G. sanguineum* +, *Geum urbanum* +, *Heracleum sphondylium* subsp. *sibiricum* +, *Inula salicina* +, *Klasea radiata* subsp. *gmelinii* +, *Lathyrus pisiformis* +, *Melica nutans* +, *Nepeta pannonica* +, *Origanum vulgare* +, *Primula veris* subsp. *macrocalyx* +, *Pteridium aquilinum* +, *Sanguisorba officinalis* +, *Senecio nemorensis* +, *Seseli libanotis* +, *Solidago virgaurea* +, *Stachys officinalis* +, *Stellaria holostea* +, *Tanacetum corymbosum* +, *Thalictrum minus* +, *Trifolium medium* +, *Veronica spuria* +, *V. teucrium* +, *Vicia cracca* +, *V. sepium* +, *Viola hirta* +, *V. mirabilis* +, *V. odorata* +, *Achillea millefolium* r, *Aconitum anthora* r, *Adonis vernalis* r, *Artemisia absinthium* r, *A. sericea* r, *Asarum europaeum* r, *Asparagus officinalis* r, *Asperula tinctoria* r, *Bupleurum longifolium* r, *Campanula persicifolia* r, *C. trachelium* r, *Carex spicata* r, *Dianthus versicolor* r, *Elytrigia repens* r, *Fallopia convolvulus* r, *Festuca valesiaca* subsp. *parviflora* r, *Galium odoratum* r, *Hieracium umbellatum* r, *Hylotelephium telephium* r, *Lathyrus rotundifolius* r, *L. pratensis* r, *Medicago falcata* r, *Orobancha alsatica* r, *Phleum pratense* r, *Poa pratensis* r, *P. transbaicalica* r, *Serratula coronata* r, *Tragopogon orientalis* r, *Trifolium lupinaster* r, *Verbascum nigrum* r, *Vincetoxicum albivianum* r.

Broad-leaved deciduous forests of the Southern Urals

(by A. Solomeshch)

Aconito lycoctoni-Tilion cordatae Solomeshch et Gri-goriev *all. nov. hoc loco*

(*Carpinetalia betuli*, *Carpino-Fagetea sylvaticae*)

Synonym: *Aconito septentrionalis-Tilion cordatae* Solomeshch et al. 1993 (ICPN art. 1)

Holotypus hoc loco: *Stachyo sylvaticae-Tilietum cordatae* Martynenko et al. 2005 (Martynenko et al. 2005)

Diagnostic taxa: *Tilia cordata*; *Aconitum lycoctonum* (= *A. septentrionale*), *Anemone altaica*, *Bromopsis benekenii*, *Bupleurum longifolium*, *Campanula latifolia*, *Crepis sibirica*, *Drymochloa sylvatica*, *Geranium robertianum*, *Heracleum sphondylium* subsp. *sibiricum*, *Lactuca macropphylla* subsp. *uralensis*, *Lamium album*, *Parasenecio hastatus*, *Pleurospermum uralense*, *Stellaria bungeana*

This alliance represents zonal broad-leaved deciduous forests of the Southern Urals. They occur on mesic rich grey forest soils of upland flat terrains, on slopes of different steepness and aspect, as well as on high riverine terraces. *Tilia cordata* predominates in the tree layer. Other trees such as *Quercus robur*, *Ulmus glabra*, *Acer platanoides*, *Populus tremula* and *Prunus padus* are typically present with lower abundance. Shrubs such as *Corylus avellana*, *Daphne mezereum*, *Euonymus verrucosa*, *Lonicera xylosteum* and *Salix caprea* form the shrub layer. Species characteristic of the *Carpino-Fagetea* and of the *Carpinetalia betuli* (e.g. *Asarum europaeum*, *Dryopteris filix-mas*, *Galium odoratum*, *Lathyrus vernus*, *Pulmonaria obscura*, *Stellaria holostea*, *Viola mirabilis* etc.) prevail in the herb layer. A group of species of Euro-Siberian distribution is represented by *Aconitum lycoctonum*, *Crepis sibirica*, *Parasenecio hastatus*, *Stellaria bungeana* and others. The alliance has the following distinguishing features: (i) presence of species of Siberian and Ural flora such as *Anemone altaica*, *Crepis sibirica*, *Parasenecio hastatus*, *Pleurospermum uralense* and *Stellaria bungeana*; (ii) absence of European trees such as *Carpinus betulus*, *Acer pseudoplatanus*, *Fagus sylvatica* and *Quercus petraea* and of herbaceous plants such as *Conval-laria majalis*, *Festuca heterophylla*, *Hepatica nobilis*, *Lamium galeobdolon* and *Mercurialis perennis*; (iii) absence of coniferous species such as *Picea obovata* and *Abies sibirica* in the tree layer as well as absence of boreal herbaceous species such as *Vaccinium vitis-idaea*, *V. myrtillus*, *Trientalis europaea*, *Maianthemum bifolium*, *Luzula pilosa*, *Goodyera repens* and of boreal mosses such as *Pleurozium schreberi*, *Hylocomium splendens* and *Dicranum scoparium*.

The alliance includes two associations:

***Stachyo sylvaticae-Tilietum cordatae* Martynenko et al. 2005**

Syn.: *Aegopodio podagrariae-Tilietum cordatae* Schubert, Jäger et Mahn 1979 (ICPN art. 5); *Aegopodio-Tilietum* Schubert, Jäger et Mahn ex Mirkin et Solomeshch 1990 (ICPN art. 1)

***Brachypodio pinnati-Tilietum cordatae* Grigoriev ex Martynenko et al. 2005**

Syn.: *Brachypodio pinnati-Tilietum cordatae* Grigoriev in Solomeshch et al. 1989 (ICPN art. 1).

The forest stands classified in these associations were described from the Southern Urals by Gorchakovskii (1972), Schubert et al. (1979), Solomeshch et al. (1989b, 1994) and Mirkin & Solomeshch (1990). None of the earlier published names was valid. Gorchakovskii (l.c.) used the Russian typological approach and provided neither an appropriate name nor a sufficient original diagnosis for the association. Schubert et al. (1979) did not provide the nomenclature type. An attempt to validate the *Aegopodio-Tilietum* by publishing its nomenclature type (Mirkin & Solomeshch 1990) was not successful because this publication was not effective (ICPN art. 1). Thus, the first valid publication of the names for these two associations appeared in Martynenko et al. (2005).

The *Stachyo sylvaticae-Tilietum cordatae* Martynenko et al. 2005 is chosen as the *typus* for the *Aconito lycoctoni-Tilion cordatae*. Since the book by Martynenko et al. (2005) might not be easily available for all readers, we present here the relevé that was chosen as the *holotypus* of this association:

Russian Federation, Bashkortostan Republic, Burzjanskij District; flat top of a mountain ridge. Approx. coordinates: 53°08' N, 56°55' E; Relevé area: 1000 m²; Cover of tree layer: 85%; Cover of shrub layer: 1%; Cover of herb layer: 65%; Average tree height: 26 m; Average diameter of tree trunks: 30 cm. Species cover-abundance values are given in the original Braun-Blanquet scale. Sampled in 2002. Field code: 305. Author of the relevé: V.B. Martynenko.

Tree layer: *Tilia cordata* 4, *Acer platanoides* 3, *A. platanoides* 2, *Prunus padus* 2, *Ulmus glabra* 2, *Betula pendula* +, *Sorbus aucuparia* r.

Shrub layer: *Rubus idaeus* +, *Lonicera xylosteum* r.

Herb layer: *Aegopodium podagraria* 3, *Aconitum lycoctonum* 2, *Crepis sibirica* 2, *Milium effusum* 1, *Pteridium aquilinum* 1, *Urtica dioica* 1, *Anthriscus sylvestris* +, *Asarum europaeum* +, *Campanula latifolia* +, *Drymoch-*

loa sylvatica +, *Dryopteris filix-mas* +, *Galium odoratum* +, *Impatiens noli-tangere* +, *Lactuca macrophylla* subsp. *uralensis* +, *Lamium album* +, *Lathyrus vernus* +, *Parasenecio hastatus* +, *Pulmonaria obscura* +, *Stachys sylvatica* +, *Stellaria holostea* +, *Viola mirabilis* +, *Brachypodium sylvaticum* r, *Bupleurum longifolium* r, *Carex pediformis* subsp. *rhizodes* r, *Epipactis helleborine* r, *Geum urbanum* r, *Paris quadrifolia* r, *Polygonatum multiflorum* r.

Hemiboreal eutrophic and mesotrophic forest swamps

(by A. Solomeshch)

Calamagrostio canescentis-Piceion abietis* Solomeshch *all. nov. hoc loco

Synonyms: *Calamagrostio canescentis-Piceion abietis* Solomeshch in Solomeshch et Grigoriev 1992 (ICPN art. 2b); *Crepido paludosae-Piceion abietis* Solomeshch in Solomeshch et Grigoriev 1992 (ICPN art. 1)

Holotypus hoc loco: *Climacio dendroidis-Piceetum abietis* Korotkov 1991 (Korotkov 1991)

Diagnostic species: *Picea abies* (dominating in the tree layer), *Calamagrostis canescens*, *Cirsium oleraceum*, *Crepis paludosa*, *Equisetum sylvaticum*, *Geum rivale*, *Luzula pilosa*, *Oxalis acetosella*, *Rubus saxatilis*, *Vaccinium myrtillus*, *V. vitis-idaea*: Mosses: *Dicranum scoparium*, *Plagiothecium laetum*, *Rhytidiadelphus triquetrus*

This vegetation encompasses the Eastern European hemi-boreal eutrophic and mesotrophic forested swamps dominated by *Picea abies*, *Alnus glutinosa* and *Betula pubescens* in the tree layer and *Frangula alnus* in the shrub layer. They develop on waterlogged peaty gley soils. Their floristic composition represents a mixture of elements characteristic of the *Alnetea glutinosae* (*Calamagrostis canescens*, *Calla palustris*, *Dryopteris carthusiana*, *Galium palustre*, *Lycopus europaeus*, *Lysimachia thyrsoflora*), the *Vaccinio-Piceetea* (*Picea abies*, *Lycopodium annotinum*, *Maianthemum bifolium*, *Trientalis europaea*, *Vaccinium myrtillus*, *V. vitis-idaea*, *Pleurozium schreberi*, *Hylocomium splendens* *Dicranum scoparium*, *Rhytidiadelphus triquetrus*), the *Alno-Populetea albae* (*Corylus avellana*, *Athyrium filix-femina*, *Chrysosplenium alternifolium*, *Cirsium oleraceum*, *Geum rivale*, *G. urbanum*, *Stellaria nemorum*, *Mercurialis perennis*), and the *Molinio-Arrhenatheretea* (*Caltha palustris*, *Deschampsia cespitosa*, *Filipendula ulmaria*, *Lysimachia vulgaris*, *Ranunculus repens*, *Scirpus sylvaticus*).

Coexistence of species with such a broad spectrum of ecological tolerance is possible due to the mosaic of microhabitats, involving elevated swamp tussocks. Wetland species of the *Alnetea glutinosae* and the *Molinietalia* cover

the area between the tussocks, while mesophilous species of the *Vaccinio-Piceetea* and the *Alnion incanae* find their ecological niches on relatively dry tussock tops. Currently this alliance includes two associations – one from Lithuania and one from the Valdai (Novgorod Oblast', Russian Federation). Balevichienė (1988) placed the Lithuanian association in the *Alno-Padion* Knapp 1942 (recte: *Alnion incanae* Pawłowski et al. 1928), while Korotkov (1991) included the association from the Valdai in the *Alnion glutinosae* Malcuit 1929. The distinctiveness of the hemi-boreal coniferous swamps of Eastern Europe and Western Siberia was reflected in the description of a new order – the *Calamagrostio canescentis-Piceetalia abietis* Solomeshch in Solomeshch et Grigoriev 1992, comprising two alliances – the *Crepido paludosae-Piceion abietis* Solomeshch in Solomeshch et Grigoriev 1992 (Eastern Europe) and the *Calamagrostio langsdorfii-Piceion obovatae* Solomeshch in Solomeshch et Grigoriev 1992 (Western Siberia). However, the publication by Solomeshch & Grigoriev (1992) must be considered as a manuscript, hence the syntaxa were not effectively published (ICPN art. 1). The Siberian alliance was validated by E. Lapshina and placed in the order *Calamagrostio purpureae-Piceetalia obovatae* Lapshina 2010 (see below).

Here we validate the alliance that represents the Eastern European hemi-boreal swamp forests. The range of this alliance includes Belarus, Ukraine, the northeast of the Russian Plain and the Ural Mts. The *Calamagrostio canescentis-Piceion abietis* differs from the Siberian alliance in the presence of European species (*Picea abies*, *Alnus glutinosa*) and diagnostic species of the *Alnion incanae* as well as in the absence of Siberian elements such as *Picea obovata*, *Pinus sibirica*, *Larix sibirica*, *Calamagrostis purpurea* and *C. obtusata* that are very common and dominant to the east of the Ural Mts.

Nemoral coniferous forests of the Southern Urals and the Southern Siberia

(by N. Ermakov)

Asaro europaei-Abietetea sibiricae Ermakov, Mucina et Zhitlukhina class. nov. hoc loco

Synonym: *Milio-Abietea* Zhitlukhina 1988 (ICPN art. 1)
Non: *Milio-Abietea* Vorobyov 2014 (ICPN arts. 2b & 5);
Milio-Abietea Lashchinskii 2014 (ICPN arts. 2b & 5);
Milio effusi-Abietetea sibiricae Zhitlukhina ex Lashchinskii et Korolyuk 2015 (ICPN art. 2b & 5)

Holotypus hoc loco: *Abietetalia sibiricae* Ermakov (2000) 2006 (Ermakov 2006)

Diagnostic taxa (the same as for the *Abietetalia sibiricae*):

Tree layer: *Abies sibirica*, *Sorbus aucuparia*; Herb layer: *Aconitum lycoctonum*, *Anemone altaica*, *Calamagrostis obtusata*, *Carex pediformis* subsp. *macroura*, *Cerastium pauciflorum*, *Cirsium helenioides*, *C. heterophyllum*, *Corydalis bracteata*, *Crepis sibirica*, *Diplazium sibiricum*, *Dryopteris expansa*, *D. filix-mas*, *Erythronium sibiricum*, *Euphorbia pilosa*, *Lathyrus gmelinii*, *Milium effusum*, *Oxalis acetosella*, *Paeonia anomala*, *Parasenecio hastatus*, *Phegopteris connectilis*, *Pleurospermum uralense*, *Ribes petraeum*, *Stellaria bungeana*

These are cool-temperate coniferous and mixed broad-leaved-coniferous forests with predominance of nemoral and hemi-boreal floristic elements. They occur on moist rich loamy soils in foothills and low mountains (300–800 m a.s.l.) of the Southern Urals and in isolated refugial areas of Southern Siberia, in local ultra-humid and weakly continental climate.

The class was ineffectively published (ICPN art. 1) by Zhitlukhina (1988) under the name *Milio-Abietea* in a manuscript on the vegetation of the Kyga River basin (NE Altai, Russian Federation). The class included one alliance (*Milio-Abietion* Zhitlukhina 1988; ICPN art. 1) with two associations of dark coniferous forests with tall-forb undergrowth. Korotkov (1991), taking into account the important diagnostic role of numerous nemoral herbs and shrubs typical of the European broad-leaved and mixed temperate forests, included the *Milio-Abietion* Zhitlukhina 1988 in the *Fagetalia sylvaticae* Pawłowski et al. 1928; this step was also supported by Ermakov (1995, 1998). Later (Ermakov et al. 2000) both the *Milio-Abietion* Zhitlukhina ex Ermakov et al. 2000 and the *Filipendulo ulmariae-Populion tremulae* Ermakov in Ermakov et al. 2000 were classified into a new suborder – the *Abietenalia sibiricae* Ermakov in Ermakov et al. 2000 within the *Fagetalia sylvaticae*. Ermakov (2006) raised the syntaxonomic rank of the *Abietenalia sibiricae* to the order level.

Martynenko et al. (2008a) validated the *Aconito septentrionalis-Piceion obovatae* Solomeshch et al. ex Martynenko et al. 2008 described from the Southern Ural Mts and included the latter also in the *Abietetalia sibiricae*.

Lashchinskii & Korolyuk (2015) made an unsuccessful attempt to validate the class *Milio-Abietetea*, proposing a syntaxonomic scheme that differs from the original concept of the class. The *Milio-Abietetea* in their sense includes both nemoral mountain forests of the *Abietetalia sibiricae* and south-boreal forests of Western Siberia classified as a new order – the *Carici macrourae-Abietetalia sibiricae*. However, the order *Carici macrourae-Abietetalia sibiricae*, which was designated as type of the class by

Lashchinskii & Korolyuk (2015), is invalidly published because its type (the alliance *Carici macrourae-Abietion sibiricae*) was also not validly published due to the fact that the typus association of the alliance (the *Aegopodio podagrariae-Abietetum sibiricae*) was invalidly published as well (one of the name-giving species of the association – *Aegopodium podagraria* – is not present in the type relevé as required by the ICPN art. 16).

Despite the predominance of the boreal *Abies sibirica* (in the Southern Urals also of *Picea obovata*) in the tree layer, the *Abietetalia sibiricae* communities have only weak floristic relationship to the boreal forests as a whole. The character species of the *Vaccinio-Piceetea* (including boreal dwarf-shrubs, herbs and bryophytes) are absent or rare. The Altai section of the class distribution range includes mixed coniferous (*Abies sibirica*, *Pinus sibirica*) and broad-leaved (*Populus tremula*, *Betula pendula*, *Tilia cordata* subsp. *sibirica*) forests with moderately open canopies (cover of 40–55 %) and well-developed herb

layer dominated by nemoral and hemi-boreal herbs (especially tall-forbs and spring geophytes) (Fig. 1). Similar communities of the Southern Urals are characterised by spruce (*Picea obovata*) with admixture of *Abies sibirica*, *Tilia cordata*, *Acer platanoides* and *Ulmus laevis*. On the whole, the floristic composition of the *Abietetalia sibiricae* is closer to the *Carpino-Fagetea* than to the *Vaccinio-Piceetea*. However, the *Carpino-Fagetea* is a class dominated by deciduous trees. Therefore, we consider the nemoral coniferous forests of the Southern Urals and Siberia as a class in its own right, showing peculiar floristic, physiognomic and ecological features where numerous species of North Eurasian and North Asian distribution play an important role. To avoid confusion with the *Milio-Abietetea sibiricae* sensu Lashchinskii & Korolyuk (2015), we choose the new name *Asaro europaei-Abietetea sibiricae* for this class.

The *Asaro europaei-Abietetea sibiricae* have a disjunctive distribution range occupying the Southern Ural



Figure 1: Nemoral coniferous forest of the *Milio-Abietion* (*Abietetalia sibiricae*, *Asaro europaei-Abietetea sibiricae*) in the Western Sayan Mts., Southern Siberia.

Slika 1: Iglasti gozd zveze *Milio-Abietion* (*Abietetalia sibiricae*, *Asaro europaei-Abietetea sibiricae*) na gorovju Zahodni Sayan, južna Sibirija.

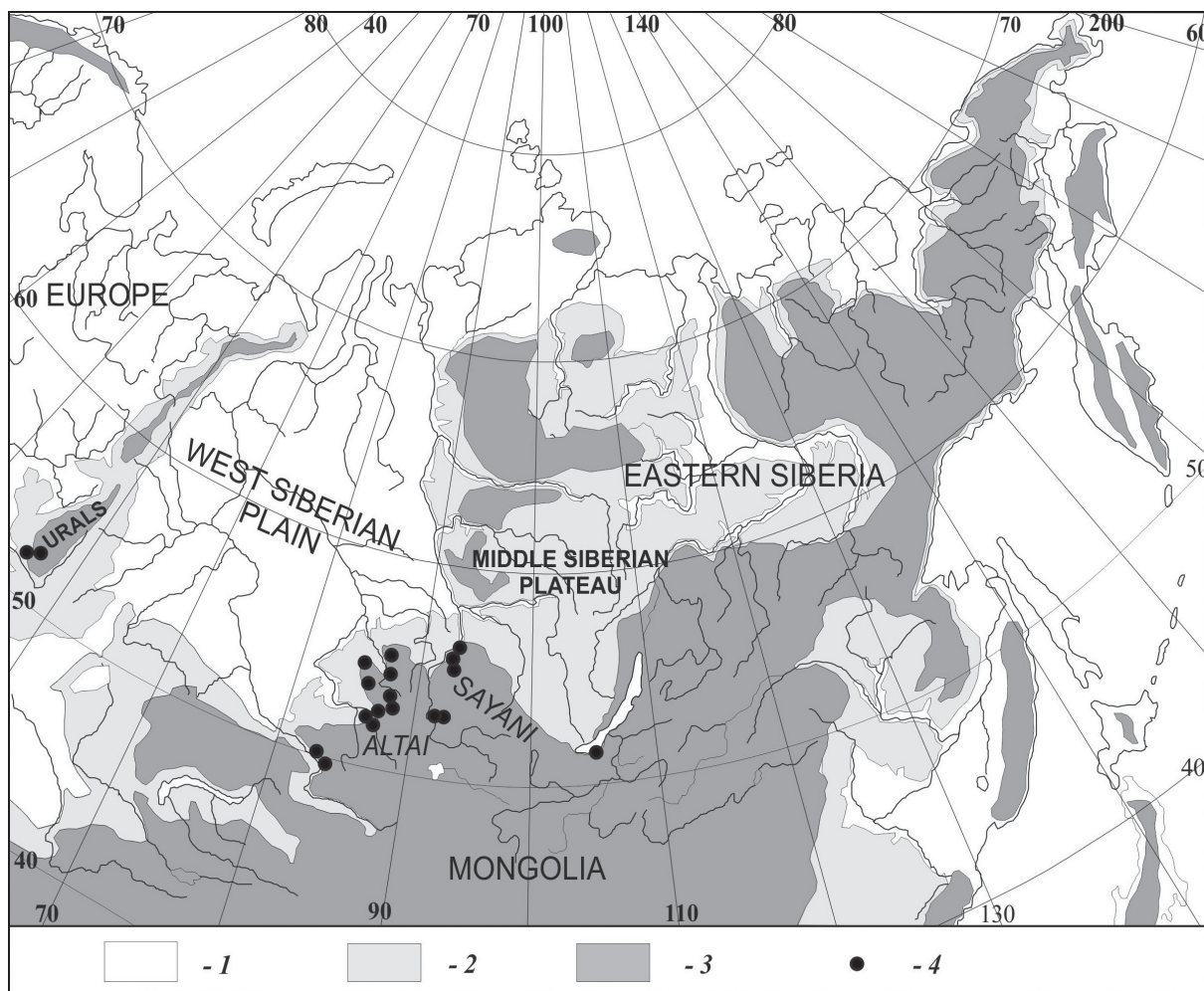


Figure 2: Distribution of the *Asaro-Abietetea* forests. 1: Plains and lowlands (altitudes of 10–200 m); 2: Lower plateaus and elevated plains (altitudes of 200–800 m); 3: Plateaus and mountains (altitudes of 800–4000 m); 4: Location of relevés of the *Asaro-Abietetea* forests.

Slika 2: Razširjenost gozdov razreda *Asaro-Abietetea*. 1: Ravnine in nižine (10–200 m nad morjem); 2: Nižji platoji in višjeležeče ravnine (200–800 m nad morjem); 3: Platoji in gorovja (800–4000 m nad morjem); 4: Lokacije popisov gozdov razreda *Asaro-Abietetea*.

(together with adjacent parts of elevated plains) and the foothills of the Altai-Sayan mountain system characterised by locally ultra-humid, weakly continental climate at altitudes of 300–800 m (Fig. 2). The link of the *Asaro europaei-Abietetea sibiricae* forests to the ultra-humid climate explains the main ecological and floristic features of this class: a relatively moderate temperature of the coldest month (January mean: -16°C) and large amount of winter precipitation (275 mm), resulting in the formation of a snow cover of up to 1.5 m that prevents freezing of the soil and protects herbs from damaging impacts of frost. The environments are favourable for species of the European broad-leaved forests (*Actaea spicata*, *Asarum europaeum*, *Brachypodium sylvaticum*, *Bromopsis beneke-nii*, *Carex sylvatica*, *Daphne mezereum*, *Drymochloa sylvatica*, *Dryopteris filix-mas*, *Galium odoratum*, *Loni-*

cera xylosteum, *Polystichum braunii*, *Sanicula europaea*, *Schenodorus giganteus*). These species have disjunctive relic ranges in the Southern Siberia. At the same time the climatic peculiarities support the occurrence of Euro-Siberian and North Asian tall forbs characteristic of subalpine forests. This tall-forb group includes *Aconitum lycoctonum*, *Angelica sylvestris*, *Bupleurum longifolium*, *Brunnera sibirica*, *Parasenecio hastatus*, *Calamagrostis purpurea* subsp. *langsдорffii*, *Cirsium heterophyllum*, *Delphinium elatum*, *Euphorbia pilosa*, *Filipendula ulmaria*, *Geranium sylvaticum*, *Lathyrus gmelinii*, *Lilium martagon*, *Matteuccia struthiopteris*, *Milium effusum*, *Paeonia anomala*, *Pleurospermum uralense*, *Senecio nemorensis*, *Veratrum lobelianum* and *Saussurea latifolia*.

Xero-thermophilous broad-leaved ravine forests of SE Europe

(by A. Čarni)

Košir et al. (2008) presented an analysis of ravine broad-leaved forests of SE Europe and adjacent areas of Central Europe, revealing that the major division in the ravine forests was between mesophilous and xero-thermophilous communities while the further division of these two major groups was spanning a geographical gradient between Central European and SE European syntaxa. Accordingly, four main types of ravine forests were treated at the suballiance level and classified within the broadly conceived *Tilio-Acerion* Klika 1955.

Since the EuroVegChecklist follows a narrower concept of classes, orders and alliances, the broad-leaved ravine forests are treated as an order of its own right, the *Aceretalia pseudoplatani* Moor 1976. Thus, the suballiances of Košir et al. (2008) should be classified as separate alliances, with the *Tilio-Acerion* s. str. including the mesophilous communities and the *Melico-Tilion platyphylli* Passarge et G. Hofmann 1968 including the xero-thermophilous communities of Central Europe. The mesophilous unit of SE Europe is known as the *Fraxino-Acerion* Fukarek 1969 (corresponding to the *Lamio orvalae-Acerenion* in Košir et al. 2008) while the xero-thermophilous unit, originally described as the suballiance *Ostryo-Tilienion* by Košir et al. (2008) lacks a legitimate name at the alliance level. Since the *Fraxino-Acerion* was validly described by Fukarek (1969), here we deal only with the xero-thermophilous ravine forests of SE Europe.

Ostryo carpinifoliae-Tilion platyphylli (Košir et al. 2008) Čarni stat. nov. hoc loco

Basionym: *Ostryo carpinifoliae-Tilienion platyphylli* Košir et al. 2008 (Košir et al. 2008: 339)

Diagnostic species: *Acer campestre*, *Clematis vitalba*, *Crataegus monogyna*, *Cyclamen purpurascens*, *Dapne laureola*, *Dioscorea communis*, *Festuca heterophylla*, *Fraxinus ornus*, *Hedera helix*, *Helleborus odoratus*, *Hepatica nobilis*, *Ligustrum vulgare*, *Melica uniflora*, *Melittis melissophyllum*, *Ostrya carpinifolia*, *Primula vulgaris*

The *Ostryo-Tilion* includes the xero-thermophilous broad-leaved ravine forests of the Apennine and Balkan Peninsulas, especially the regions characterised by sub-mediterranean climate. The diagnostic species are partly shared with the thermophilous deciduous oak forests and partly with the thermophilous beech forests. The occurrence of this unit on both sides of the Adriatic Sea points upon shared climatic conditions and florogenetic

history of both Peninsulas during the Quaternary (Košir et al. 2008).

Evergreen oak forests of Cyprus

(by E. Bergmeier)

The '*Quercion alnifoliae*' was proposed by Barbero & Quézel (1979: 22). However, the name was invalid according to art. 2b ICPN because the two associations in the original diagnosis ('*association à Quercus alnifolia et Pinus brutia*' and '*association à Quercus alnifolia et Crepis frassii*') were both invalidly published due to the form of the name (ICPN art. 3h) and the failure to designate the nomenclature type (ICPN art. 5). The name '*Quercion alnifoliae*' remained invalid in Quézel et al. (1993) because the name '*Quercus alnifoliae-Pinetum brutiae* Barbero et Quézel 1979' designated as the type was invalid due to the missing type relevé for the type association. Therefore we validate the name *Quercion alnifoliae* here as follows:

Quercion alnifoliae Barbero et Quézel ex Bergmeier, Mucina et Theurillat all. nov. hoc loco

(*Quercetalia calliprini*, *Quercetia ilicis*)

Diagnostic taxa: Trees: *Quercus alnifolia*, *Pinus brutia*;

Herbs and low shrubs: *Crepis fraasii*, *Erophaca baetica* subsp. *orientalis* *Helichrysum italicum* subsp. *italicum*, *Lecokia cretica*, *Salvia fruticosa*, *Stellaria cilicica*, *Teucrium kotschyianum*

Holotypus (*hoc loco*) of the alliance: *Quercus alnifoliae-Pinetum brutiae* Barbero et Quézel ex Bergmeier, Mucina et Theurillat ass. nov. hoc loco

Holotypus (*hoc loco*) of the association: Barbero & Quézel (1979: 23, Table 7, rel. 7).

According to its current circumscription, as suggested by Barbero & Quézel (1979), the *Quercion alnifoliae* comprises sclerophyllous woodlands on igneous rock of Mt. Troodos, Cyprus, found at altitudes spanning (500–) 700–1200 (–1300) m. Common woody species are *Arbutus andrachne*, *Lonicera etrusca*, *Pinus brutia*, *Pistacia terebinthus* subsp. *palaestina* and the Cyprian endemic *Quercus alnifolia*. *Pinus brutia*, *Quercus alnifolia* and, more rarely, *Acer obtusifolium* and *Cedrus libani* subsp. *brevifolia* may be the dominating trees. The *Quercion alnifoliae* is an alliance endemic to the island of Cyprus, but shares many species with woody formations of *Quercus*, *Pinus*, *Pistacia* and *Styrax* elsewhere in the Eastern Mediterranean.

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