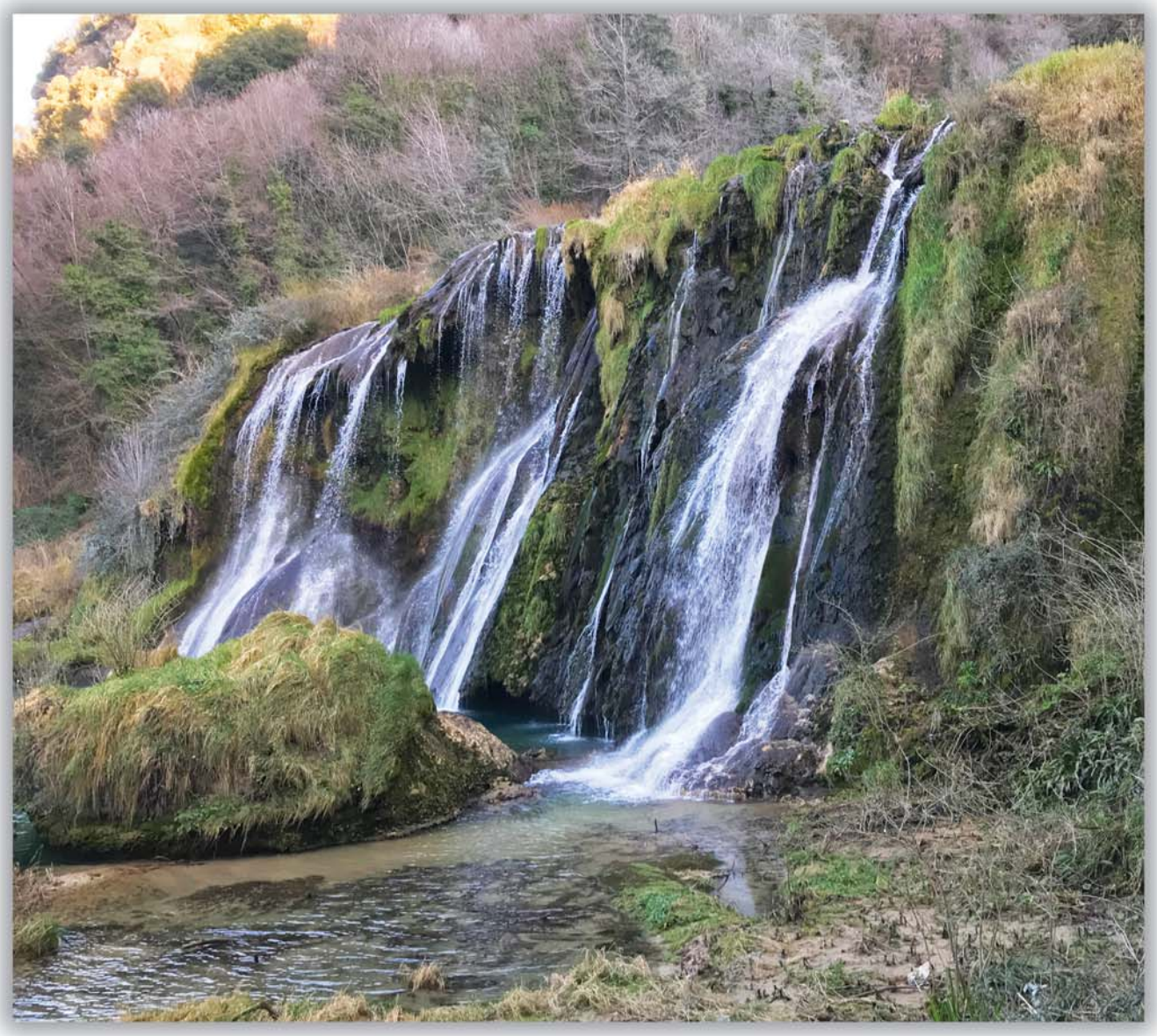
PLANT SOCIOLOGY

formerly FITOSOCIOLOGIA

Volume 55 (1) - June 2018

RIVISTA SEMESTRALE - POSTE ITALIANE S.P.A. - SPED. ABB. POST. - D.L. 353/2003 - (CONV. IN L. 27/02/2004 N. 46) ART. 1, COMMA 2, DCB ANCONA TASSA RISCOSSA-TAXE PERÇUE-CMPP AN
EDITO DALLA SOCIETA' ITALIANA DI SCIENZA DELLA VEGETAZIONE ONLUS - PAVIA - DIRETTORE RESPONSABILE PROF. E. BIONDI - VOLUME 1 - I° SEMESTRE 2018



Journal of the Italian Society for Vegetation Science

Plant Sociology, Vol. 55, No. 1, June 2018, pp. 45-52
DOI 10.7338/pls2018551/04

PLANT SOCIOLOGY
©Italian Society for Vegetation Science

Two new *Fraxinus angustifolia* subsp. *oxycarpa*-dominated associations from north-eastern Italy (Friuli-Venezia Giulia and Veneto)

L. Poldini[1], G. Sburlino[2]
[1]*Department of Life Sciences*, *University of Trieste*, *Via L. Giorgeri 5*, *I-3417 Trieste*, *Italy.*
[2]*Department of Environmental Sciences*, *Informatics and Statistics*, *Via Torino 155*, *I-30170 Venezia Mestre*, *Italy.*

Abstract
The floristic-sociological analysis of *Fraxinus angustifolia* subsp. *oxycarpa*-dominated woods coming from north-eastern Italy and the comparison with phytosociological tables of other Italian and Croatian communities, led to the description of two new associations respectively belonging to *Carici remotae-Fraxinion oxycarpae* (*Salici purpureae-Populetea nigrae*) and *Frangulo alni-Fraxinion oxycarpae* (*Alnetea glutinosae*): the floodplain/riparian *Lysimachio nummulariae-Fraxinetum oxycarpae* and the swampy *Valeriano dioicae-Fraxinetum oxycarpae*.

Key words: floodplain-riparian woods and swamps, north-eastern Italy, syntaxonomy.

Introduction

The *Fraxinus angustifolia* subsp. *oxycarpa*-rich woods only occur in few localities of the Friuli-Venezia Giulia and Veneto regions and their syntaxonomic position is still unclear. They include both swampy coenoses which develop on hydromorphic soils in some restricted areas of the Karst near Monfalcone (Gorizia, Venezia Giulia) and communities occurring along rivers or in temporarily flooded depressions among the alluvial plain. From the syntaxonomic point of view, all these woods were so far referred to *Leucojo-Fraxinetum oxycarpae* (Poldini, 1997; Poldini *et al.*, 2009), an association originally described by Glavač (1959) for some continental areas of Croatia.

The aim of this study is to define the correct syntaxonomic position of these coenoses, by comparison with ecologically similar *Fraxinus angustifolia* subsp. *oxycarpa*-rich communities coming from other Italian and Croatian areas.

Materials and methods

The analysis was carried out according to the phytosociological approach (Braun-Blanquet, 1964; Géhu & Rivas-Martínez, 1981; Rivas-Martinez, 2005; Biondi, 2011; Pott, 2011). Relevés were elaborated on the basis of hierarchical classifications using the package Syn-tax 2000 (Podani, 2001). The synthetic tables of the Italian communities were then compared with data in the literature from other areas of Italy and Croatia. The synoptic table was then subjected to hierarchical classification. Both the analytic and the synthetic tables were arranged according to the results of the multivariate classification. The taxonomic nomenclature corresponds to Pignatti (1982) and Tutin *et al.* (1964-1980); considering the different degree of taxonomic precision reached by the authors in the phytosociological tables, the informal categories of "aggregate" (aggr.) or "*sensu latu*" (*s.l.*) were used for some *taxa*. Data concerning the analytic tables (locations, names of the authors, sources of the relevés and accidental species) are quoted in the Appendices. The sources of the relevés and the *syntaxa* names of the communities in the synoptic tables are cited in the tables.

Results

The dendrogram of the relevés coming from the Friuli-Venezia Giulia and Veneto regions highlights the presence of two main clusters (1 and 2 in Fig. 1).

Cluster 1: this group includes 6 stands that correspond to communities which develop on clay or silty-clay soils along rivers or in temporarily flooded areas of the alluvial plain. On the whole, these relevés display a high degree of frequency (≥ 50%) of species such as: *Acer campestre*, *Brachypodium sylvaticum*, *Carex acutiformis*, *Carex pendula*, *C. remota*, *Clematis viticella*, *Cornus sanguinea* subsp. *hungarica*, *Hedera helix*, *Iris pseudacorus*, *Leucojum aestivum*, *Lysimachia nummularia*, *Parietaria officinalis*, *Poa sylvicola*, *Populus nigra*, *Prunus spinosa*, *Quercus robur*, *Rubus caesius*, *Rumex sanguineus*, *Salix alba*, *Sambucus nigra*, *Typhoides arundinacea*, *Ulmus minor* and *Urtica dioica*.

Cluster 2: this group includes 6 stands that correspond to *Fraxinus angustifolia* subsp. *oxycarpa* swamps which develop on hydromorphic soils with large amounts

Corresponding author: Livio Poldini. *Department of Life Sciences*, *University of Trieste*, *Via L. Giorgeri 5*, *I-3417 Trieste*, *Italy; e-mail: poldini@units.it*

of slightly decomposed organic matter, coming from marshy karstic areas. The most frequent species of this group are: *Alnus glutinosa*, *Carex elata*, *C. flava s.s.*, *Cornus sanguinea* subsp. *hungarica*, *Crataegus monogyna*, *Eupatorium cannabinum*, *Frangula alnus*, *Galium elongatum*, *Hedera helix*, *Iris pseudacorus*, *Leucojum aestivum*, *Lycopus europaeus*, *Lysimachia vulgaris*, *Lythrum salicaria*, *Phragmites australis*, *Populus nigra*, *Ranunculus repens*, *Rhamnus catharticus*, *Ruscus aculeatus*, *Thalictrum lucidum*, *Thelypteris palustris*, *Ulmus minor* and *Valeriana dioica*.

Two principal clusters (1 and 2 in Fig. 2) can be identified even in the dendrogram of the synthetic tables and both the clusters can be divided into two subclusters (1a, 1b and 2a, 2b). Two separate synoptic tables illustrating the results of the cluster analysis were then created (Tabs. 1 and 2).

Cluster 1: this group includes meso-hygrophilous and hygrophilous *Fraxinus angustifolia* subsp. *oxycarpa*-rich communities which develop on mineral soils, from north-eastern, central and southern Italy (Pedrotti, 1970, 1984; Corbetta & Censoni Zanotti, 1974; Pedrotti & Cortini Pedrotti, 1978; Conti & Pirone, 1992; Pedrotti & Gafta, 1992; Biondi *et al.*, 2002; Biondi & Allegrezza, 2004; Allegrezza *et al.*, 2010). On the whole, these communities share the occurrence of *Ulmus minor*, *Carex pendula*, *Cornus sanguinea s.l.*, *Acer campestre* and *Prunus spinosa*. More particularly, subcluster 1a collects the meso-hygrophilous *Rubo caesii-Ulmetum* from the alluvial plain of Romagna, the colline meso-hygrophilous *Salici apenninae-Fraxinetum* from a pre-Apennines area of Central Italy and the hygrophilous community subject of this research (synthetic tables 1-3 in Tab. 1); all the above-mentioned coenoses share the high frequency of the meso-hygrophilous *Rubus caesius*. Subcluster 1b includes central and southern Italian communities such as the hygrophilous floodplain/riparian *Carici remotae-Fraxinetum* and the meso-hygrophilous *Carici remotae-Fraxinetum iridetosum foetidissimae* and *Rubio peregrinae-Fraxinetum*, respectively from colline and lowland areas (synthetic tables 4-8 in Tab. 1); all these communities share the occurrence, even with high frequency values, of thermophilous Mediterranean species (*Ruscus aculeatus*, *Smilax aspera*, *Rosa sempervirens*, *Rubia peregrina*, etc.) which are only accidentally present or completely absent in the coenoses of subcluster 1a; this Mediterranean component is particularly represented in *Rubio peregrinae-Fraxinetum* (synthetic table 8 in Tab. 1) in which *Asparagus acutifolius* and *Laurus nobilis* reach the highest frequency values.

Cluster 2: on the whole, this group includes *Fraxinus angustifolia* subsp. *oxycarpa* swamps coming from marshy areas of north-eastern and central-western Italy as well as from continental Croatia (Glavač, 1959; Rauš, 1973; Piccoli *et al.*, 1983; Stanisci *et al.*, 1998; Merloni & Piccoli, 2001). All these coenoses share the occurrence of *Frangula alnus*, *Galium palustre* aggr., *Lycopus europaeus* and *Mentha aquatica*. Subcluster 2a (synthetic tables 1-4 in Tab. 2) collects the Italian communities, namely the unpublished table from the Karst near Monfalcone and three synthetic tables of the interdunal *Cladio-Fraxinetum oxycarpae* and *Cladio-Fraxinetum oxycarpae caricetosum otrubae*, respectively coming from the coasts of Romagna and Lazio; a characteristic feature of this group is the exclusive occurrence of *Cladium mariscus*. Subcluster 2b groups the Croatian coenoses (*Leucojo-Fraxinetum* and *Leucojo-Fraxinetum alnetosum*; synthetic tables 5-6 in Tab. 2) which are well differentiated from the Italian ones by a large number of exclusive species such as: *Alisma lanceolatum*, *Cardamine pratensis* subsp. *dentata*, *Carex elongata*, *C. vesicaria*, *C. vulpina*, *Mentha* x *verticillata*, *Myosotis scorpioides*, *Poa trivialis*, *Polygonum hydropiper*, *Sium latifolium*, etc.; another distinctive feature of the Croatian communities with respect to the Italian ones consists of the higher expression of the

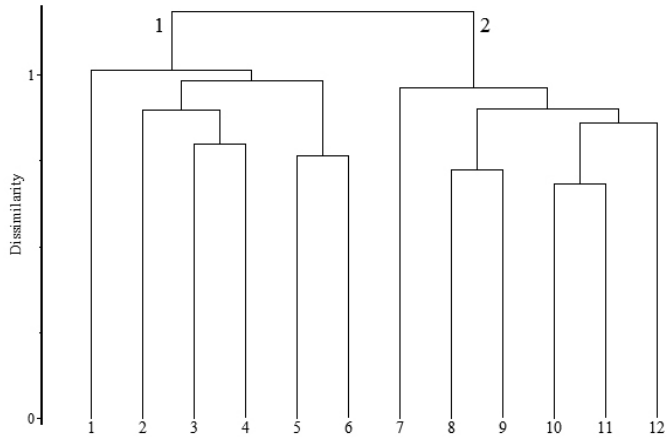


Fig. 1 - Dendrogram of the 12 relevés from Friuli-Venezia Giulia and Veneto. Algorithm: average link, chord distance.

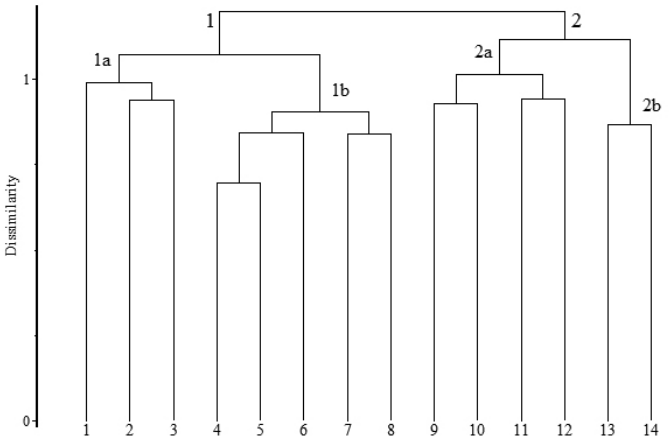


Fig. 2 - Dendrogram of the synthetic tables. Algorithm: average link, chord distance.

Tab. 1 - col. 1: *Rubo caesii-Ulmetum*, Panfilia forest (Ferrara, N-Italy), Corbetta & Censoni Zanotti (1974) tab. 1 rels. 1-10; col. 2: *Salici apenninae-Fraxinetum oxycarpae*, pre-Apennines area of Marche (Ancona, C-Italy), Allegrezza et al. (2010) tab. 3; col. 3: *Lysimachio nummulariae-Fraxinetum oxycarpae*, tab. 3 this paper; col. 4: *Carici remotae-Fraxinetum oxycarpae*, near Sinello River (Abruzzo, C-Italy), Pedrotti (1970) tab. 2; col. 5: *Carici remotae-Fraxinetum oxycarpae*, Adriatic coast of CS-Italy (Apulia and Molise), Pedrotti & Cortini Pedrotti (1978) rels. 1-17; col. 6: *Carici remotae-Fraxinetum oxycarpae*, Alvano wood (Apulia, S-Italy), Pedrotti (1984) tab. 1; col. 7: *Carici remotae-Fraxinetum oxycarpae iridetosum foetidissimae*, Vallaspra wood (Abruzzo, C-Italy), Conti & Pirone (1992) tab. 1; col. 8: *Rubio peregrinae-Fraxinetum oxycarpae*, Persano (Campania, S-Italy) 1 rel. in Pedrotti & Gafta (1992); near Musone River (Marche, C-Italy), Biondi et al. (2002) tab. 16; Selva of Gallignano basin (Marche, C-Italy), Biondi & Allegrezza (2004) tab. 4.

No. of order	1	2	3	4	5	6	7	8
No. of Tables (dendrogram of Fig. 2)	2	3	1	4	5	6	7	8
Number of relevés	10	9	6	5	17	6	9	7
Amorpha fruticosa	90	.	.	.	.	.	.	.
Frangula alnus	40	.	.	.	.	.	.	.
Salix apennina	.	100	.	.	.	.	.	.
Genista tinctoria	.	67	.	.	.	.	.	.
Brachypodium rupestre	.	55	.	.	.	.	.	.
Quercus pubescens	.	55	.	.	.	17	.	.
Rosa canina	.	44	.	.	.	.	.	.
Lysimachia nummularia	.	.	83	.	.	.	.	.
Urtica dioica	.	.	67	.	24	.	.	.
Carex acutiformis	.	.	67	.	.	.	.	.
Iris pseudacorus	.	.	67	.	29	17	.	.
Leucojum aestivum	.	.	67	.	.	.	.	.
Typhoides arundinacea	.	.	50	.	.	.	.	.
Parietaria officinalis	.	.	50	.	.	.	.	.
Rubus caesius	100	89	100	.	.	17	.	14
Ficaria verna s.l.	.	.	17	100	71	100	.	29
Oenanthe pimpinelloides	.	.	.	100	41	83	.	.
Stachys sylvatica	.	.	.	40	53	100	11	.
Carex vulpina	.	.	.	20	47	.	.	.
Solanum dulcamara	.	.	.	.	47	83	.	.
Lycopus europaeus	10	.	.	.	47	50	.	.
Arum maculatum	.	.	.	.	.	100	.	29
Lonicera etrusca	.	.	.	.	.	67	.	14
Galium palustre aggr.	.	.	17	.	.	.	56	.
Ranunculus sardous	.	.	.	.	.	.	44	.
Iris foetidissima	.	.	.	.	.	.	100	57
Asparagus acutifolius	.	11	17	.	24	17	22	86
Laurus nobilis	.	.	.	.	24	.	.	86
Cyclamen hederifolium	.	.	.	.	.	.	.	43
Agrostis stolonifera	.	.	.	.	.	.	.	43
Ruscus aculeatus	.	11	17	80	53	83	89	100
Smilax aspera	.	.	.	40	47	17	22	29
Rosa sempervirens	.	22	.	.	59	83	44	100
Rubia peregrina	.	.	.	.	71	33	11	86
Cyclamen repandum	.	.	.	.	24	17	.	.
Quercus ilex	.	.	.	.	6	.	.	14
Diff. species of *Carici remotae-Fraxinion oxycarpae*								
Fraxinus angustifolia subsp. oxycarpa	100	100	100	100	100	100	100	100
Ulmus minor	100	67	67	100	94	100	100	86
Carex pendula	100	33	67	80	94	100	56	57
Ranunculus lanuginosus (incl. R. velutinus)	.	11	.	100	88	83	44	86
Rumex sanguineus	.	.	67	100	88	100	22	.
Carex remota	.	.	83	100	47	.	44	.
Carex divulsa	.	.	.	40	12	67	44	.
Populetalia albae and *Salici-Populetea*								
Brachypodium sylvaticum	60	.	67	60	59	100	22	86
Tamus communis	.	22	17	.	71	100	33	43
Geum urbanum	.	.	33	20	18	67	44	57
Populus alba (incl. P. canescens)	100	78	.	100	82	.	.	14
Arum italicum	.	.	17	100	82	.	44	71
Equisetum telmateja	.	55	33	20	18	50	.	.
Salix alba	60	89	50	.	.	50	.	.
Symphytum tuberosum s.l.	.	.	.	20	18	100	.	57
Clematis viticella	90	.	83	.	35	.	.	43
Calystegia sepium	.	.	33	.	29	33	.	14
Vitis vinifera s.l.	20	.	.	.	47	17	.	14
Bryonia dioica	.	.	17	20	12	100	.	.
Populus nigra	.	67	67	.	.	17	.	.
Sambucus nigra	.	.	83	.	.	17	.	29
Malus sylvestris	.	22	.	.	47	.	.	.
Chaerophyllum temulum	.	.	.	.	12	67	.	.
Humulus lupulus	.	.	33	.	6	.	.	.
Eupatorium cannabinum	.	.	17	.	6	.	.	.
Salix fragilis	.	.	.	.	53	.	.	.
Salix purpurea	.	44	.	.	.	.	.	.
Cucubalus baccifer	.	.	17	.	.	.	.	.
Salix triandra	.	11	.	.	.	.	.	.
Other species								
Cornus sanguinea s.l.	80	100	83	60	65	67	89	43
Acer campestre	40	55	100	20	59	33	33	14
Prunus spinosa	100	100	50	60	12	83	44	57
Hedera helix	.	44	67	80	88	50	100	100
Rubus ulmifolius	.	67	17	80	100	83	78	43
Ligustrum vulgare	50	11	17	.	76	83	22	57
Prunella vulgaris	.	44	.	80	12	83	56	14
Crataegus laevigata	30	.	17	80	71	.	67	14
Carex sylvatica	.	.	17	20	18	.	100	14
Quercus robur	100	11	67	80	35	.	.	.
Euonymus europaeus	.	.	17	.	76	83	56	71
Lonicera caprifolium	.	33	17	20	59	.	.	29
Crataegus monogyna	.	89	17	.	.	100	.	71
Poa trivialis aggr. (incl. P. sylvicola)	.	.	50	100	35	83	.	.
Clematis vitalba	30	22	.	20	18	50	.	.
Ranunculus repens	.	11	33	.	47	50	.	.
Viola reichenbachiana	.	.	17	20	12	.	33	14
Carex otrubae	.	.	17	.	.	50	11	14
Ajuga reptans	.	.	17	.	12	.	33	14
Stellaria media	.	.	.	.	6	17	11	14
Carex flacca aggr.	.	44	.	.	.	.	22	29
Galium aparine	.	.	17	.	.	67	.	29
Sison amomum	.	.	.	20	29	50	.	.
Fraxinus ornus	10	44	.	.	.	.	.	43
Bellevallia romana	.	.	.	.	18	33	.	29
Quercus cerris	.	.	.	20	12	.	11	.
Viola alba s.l.	.	22	.	.	.	33	.	29
Potentilla reptans	.	11	.	20	35	.	.	.
Tussilago farfara	.	22	.	.	6	17	.	.
Primula vulgaris	.	11	.	.	6	.	11	.

Nordic and/or continental element which is represented by species such as *Athyrium filix-foemina*, *Cardamine pratensis* subsp. *dentata*, *Carex elongata*, *C. vesicaria*, *C. vulpina*, *Myosotis scorpioides*, *Scutellaria galericulata*, *Thalictrum flavum*, *Veronica scutellata*.

The synoptic tables (Tabs. 1 and 2) illustrate these results and highlight the differential species of single synthetic table and of groups of synthetic tables.

Discussion

The results of the cluster and synoptic tables analysis allow us to recognize two new ecologically and floristically distinct associations.

In regards to the meso-hygrophilous and hygrophilous *Fraxinus angustifolia* subsp. *oxycarpa*-rich communities of the synoptic Tab. 1, the analysis clearly shows a connection of all the considered syntaxa with the *Salici purpureae-Populetea nigrae* class, order *Populetalia albae*; the *Carici remotae-Fraxinion oxycarpae*, an alliance recently formalized by Biondi *et*

Tab. 2 - col. 1: *Valeriano dioicae-Fraxinetum oxycarpae*, tab. 4 this paper; col. 2: *Cladio-Fraxinetum oxycarpae*, interdunal areas of Romagna (Ravenna, N-Italy), Merloni & Piccoli (2001) tab. 1 rels. 1-9; col. 3: *Cladio-Fraxinetum oxycarpae*, interdunal areas of Romagna (Ferrara, N-Italy), Piccoli *et al*. (1983) tab. 1 rels. 1-7; col. 4: *Cladio-Fraxinetum oxycarpae caricetosum otrubae*, interdunal areas of Lazio (Latina, C-Italy), Stanisci *et al*. (1998) tab. 1 rels. 6-11; col. 5: *Leucojo-Fraxinetum angustifoliae*, continental Croatia, Glavač (1959) rels. 1-23; col. 6: *Leucojo-Fraxinetum angustifoliae alnetosum*, continental Croatia, Rauš (1973) tab. 3.

N. of order	1	2	3	4	5	6
No. of Tables (dendrogram of Fig. 2)	9	10	11	12	13	14
Number of relevés	6	9	7	6	23	5
Thalictrum lucidum	83	.	.	.	.	.
Phragmites australis	50	11	.	17	.	.
Carex flava s.s.	50	.	.	.	.	.
Rubus ulmifolius	.	22	71	100	.	.
Vitis vinifera s.l.	.	22	29	67	.	.
Prunus spinosa	.	89	86	.	.	.
Samolus valerandi	.	.	57	50	.	.
Carex flacca aggr.	.	.	43	67	.	.
Carex otrubae	.	.	.	67	.	.
Smilax aspera	.	.	.	50	.	.
Alisma lanceolatum	.	.	.	.	100	.
Cardamine pratensis subsp. dentata	.	.	.	.	100	.
Myosotis scorpioides	.	.	.	.	96	.
Euphorbia palustris	.	33	.	.	91	.
Rorippa amphibia	.	22	.	.	87	.
Mentha x verticillata	.	.	.	.	83	.
Sium latifolium	.	33	.	.	83	.
Gratiola officinalis	.	.	.	.	57	.
Veronica anagallis-aquatica	.	.	.	.	57	.
Rorippa sylvestris	.	.	.	.	43	.
Thalictrum flavum	.	.	.	.	43	.
Poa trivialis	.	.	.	.	83	80
Polygonum hydropiper	.	.	.	.	78	80
Carex vulpina	.	.	.	.	57	80
Carex vesicaria	.	.	.	.	83	40
Carex remota	.	.	.	.	43	80
Urtica dioica	.	11	.	.	57	60
Oenanthe fistulosa	.	.	.	.	91	20
Teucrium scordium	.	.	.	.	87	20
Veronica scutellata	.	.	.	.	61	40
Genista tinctoria	.	.	.	.	48	40
Scutellaria galericulata	.	.	.	.	57	20
Juncus effusus	.	.	.	.	22	60
Rumex sanguineus	.	.	.	.	39	80
Glechoma hederacea	.	.	.	.	4	80
Hypericum tetrapterum	.	.	.	17	.	60
Prunella vulgaris	17	.	.	.	17	60
Crataegus laevigata	.	.	.	.	.	60
Athyrium filix-foemina	.	.	.	.	.	60
Succisa pratensis	.	.	.	.	.	60
Geum urbanum	.	.	.	.	.	60
Aegopodium podagraria	.	.	.	.	.	40
Lapsana communis	.	.	.	.	.	40
Diff. species of *Frangulo alni-Fraxinion oxycarpae*						
Fraxinus angustifolia subsp. oxycarpa	100	100	100	100	100	100
Cladium mariscus	33	56	100	50	.	.
Populus alba (incl. P. canescens)	.	78	100	.	.	.
Alnetalia glutinosae and *Alnetea glutinosae*						
Frangula alnus	100	100	100	100	17	80
Galium palustre aggr.	83	11	86	83	100	100
Lycopus europaeus	67	67	14	33	96	80
Alnus glutinosa	50	22	.	.	17	100
Peucedanum palustre	17	11	.	.	9	40
Thelypteris palustris	50	22	71	.	.	.
Salix cinerea	17	44	.	50	.	.
Carex elongata	.	.	.	.	52	80
Dryopteris carthusiana	.	.	.	.	13	60
Hydrocotyle vulgaris	.	.	29	.	.	.
Phragmito-Magnocaricetea						
Mentha aquatica	33	89	57	83	91	40
Lythrum salicaria	67	56	.	100	100	.
Iris pseudacorus	67	89	.	50	100	100
Lysimachia vulgaris	50	89	.	67	78	100
Carex elata	100	78	.	17	26	.
Stachys palustris	.	78	.	.	91	100
Alisma plantago-aquatica	.	22	.	.	30	40
Carex riparia	.	56	.	.	43	.
Carex acutiformis	.	.	86	.	4	.
Glyceria fluitans	.	.	.	.	39	20
Typhoides arundinacea	17	.	.	.	30	.
Rumex hydrolapathum	.	11	.	.	4	.
Cyperus longus	.	.	.	33	.	.
Sparganium erectum	.	.	.	.	22	.
Poa palustris	.	.	.	.	.	20
Berula erecta	17	.	.	.	.	.
Veronica beccabunga	17	.	.	.	.	.
Oenanthe aquatica	.	.	.	.	13	.
Other species						
Quercus robur	.	56	71	67	48	80
Ulmus minor	50	44	86	.	22	80
Calystegia sepium	17	44	29	83	.	40
Rubus caesius	33	11	29	.	26	60
Agrostis stolonifera	.	11	57	50	13	20
Leucojum aestivum	100	11	.	.	100	60
Solanum dulcamara	17	89	.	.	74	100
Hedera helix	50	11	57	67	.	.
Lysimachia nummularia	.	44	.	.	100	100
Crataegus monogyna	100	67	71	.	.	.
Ranunculus repens	67	.	.	.	100	60
Eupatorium cannabinum	67	.	.	33	.	40
Pyrus piraster	.	56	43	.	.	40
Rhamnus catharticus	50	78	14	.	.	.
Cornus sanguinea s.l.	67	11	43	.	.	.
Potentilla reptans	.	.	43	33	30	.
Caltha palustris	33	.	.	.	22	40
Bidens tripartita	.	33	.	.	17	20
Acer campestre	17	.	.	17	.	20
Valeriana dioica	100	.	.	.	.	80
Salix alba	.	67	.	.	39	.
Viburnum opulus	67	33	.	.	.	.
Populus nigra	50	33	.	.	.	.
Ruscus aculeatus	50	.	29	.	.	.
Carex distans	.	.	57	17	.	.
Quercus ilex	.	.	43	33	.	.
Ligustrum vulgare	17	.	43	.	.	.
Deschampsia caespitosa	.	.	.	.	22	20
Aristolochia clematitis	.	.	.	.	13	20
Holcus lanatus	.	.	14	17	.	.
Ficaria verna s.l.	.	.	.	.	9	20
Althaea officinalis	.	11	.	17	.	.
Symphytum officinale	17	11	.	.	.	.
Juncus articulatus	17	.	.	17	.	.

al. (2014) is well represented too, especially in the synthetic tables 3-7. As regards the association level, the Friulian-Venetian riparian coenosis does not share sufficient elements for being referred to the geographically close *Rubo caesii-Ulmetum*; as a matter of fact, even if both these communities share high frequency values of *Rubus caesius* and *Clematis viticella*, the relevés coming from Friuli and Veneto are well differentiated by means of the high frequency of species that are lacking in the table of *Rubo caesii-Ulmetum* (*Lysi-*

machia nummularia, *Leucojum aestivum*, *Carex acutiformis*, *C. remota*, *Iris pseudacorus*, *Urtica dioica*, *Typhoides arundinacea*, *Parietaria officinalis*, *Rumex sanguineus*, *Sambucus nigra*); actually, the aforementioned association, which was described by Brullo & Spampinato (1999) on the basis of relevés by Corbetta & Censoni Zanotti (1974; "*Carici-Fraxinetum angustifoliae* Pedrotti 1970"), is floristically poor and affected by degradation processes (e.g. high frequency of *Amorpha fruticosa*) as already explained by these authors in their original paper. The examined community cannot even be referred to *Salici apenninae-Fraxinetum*, a Central Appennines association characterized by specific ecological and floristic features (Allegrezza *et al.*, 2010). Finally, the previously mentioned very low expression of the Stenomediterranean element in addition to other floristic differences (very low frequency of *Ficaria verna* and absence of species such as *Oenanthe pimpinelloides*, *Stachys sylvatica* and *Carex vulpina*), do not allow to assign our relevés to *Carici remotae-Fraxinetum*, an association which shares similar ecological features. On the basis of these considerations, the Friulian-Venetian riparian coenosis may be referred to a new association, named *Lysimachio nummulariae-Fraxinetum oxycarpae* (Tab. 3).

The analysis of the synoptic table of the swampy communities (Tab. 2) shows an overall good expression of entities belonging to the *Alnetea glutinosae* class as well as of many marshy species of *Phragmito-Magnocaricetea* which well differentiate these coenoses from the afore considered communities. Both the table from the karstic area and the ones of *Cladio-Fraxinetum* (synthetic tables 1-4 of Tab. 2) can be definitely referred to *Frangulo alni-Fraxinion oxycarpae*, a recently described *Alnetea glutinosae* alliance (Biondi *et al.*, 2015); indeed, this alliance includes the *Fraxinus angustifolia* subsp. *oxycarpa*-rich swamps that develop on hydromorphic soils with large amounts of slightly decomposed organic matter, in karstic depressions near the coast of north-eastern Italy and in North Adriatic and central-western Italian interdunal areas. With respect to *Cladio-Fraxinetum*, the karstic community differs for the different geomorphological context (karstic marshes vs. interdunal depressions) and for the occurrence of species such as *Valeriana dioica*, *Thalictrum lucidum* and *Carex flava s.s.* which are absent in the interdunal coenosis; all these features allow us to assign our stands to a new association named *Valeriano dioicae-Fraxinetum oxycarpae* (Tab. 4). As previously pointed out, the Croatian *Leucojo-Fraxinetum* (synthetic tables 5-6 of Tab. 2) significantly differs from the Italian associations both for its floristic and phytogeographic features so that it cannot be referred to the above-mentioned *Frangulo-Fraxinion* alliance. In the original description by Glavač (1959) this association was included in *Alno-Quercion roboris*, an alliance described by Horvat (1950) for the former Yugoslavia; this opinion was later shared by many authors (Rauš, 1973; Horvat *et al.*, 1974; Brullo & Spampinato,1999; Trinajstić, 2008; Šilc & Čarni, 2012; Dakskobler *et al.*, 2013; etc) that from time to time assigned it to *Populetalia albae*, *Fagetalia sylvaticae*, *Fraxinetalia* and *Alno-Fraxinetalia excelsioris*; recently Mucina *et al.* (2016) and Škvorc *et al.* (2017) included *Alno-Quercion roboris* in the last of the aforementioned orders and defined it as an alliance of the temperate regions of the Balkan Peninsula. By contrast, Vukelić (2012) affirmed that *Alno-Quercion roboris* should be further analyzed in detail and assigned *Leucojo-Fraxinetum* to *Alnion incanae* (*Fagetalia*); finally, Douda *et al.* (2015) considered *Alno-Quercion roboris* a synonim of *Alnion incanae* and included *Leucojo-Fraxinetum* in *Alnion glutinosae*. In conclusion it should be rather evident that the syntaxonomic position of this south-eastern European association still represents a quite problematic subject.

Description of the new communities

LYSIMACHIO NUMMULARIAE - FRAXINETUM OXYCARPAE ass. nova *hoc loco* (Tab. 3)

Holotypus: rel. 2 in tab. 3.

Differential species: *Lysimachia nummularia*, *Leucojum aestivum*, *Urtica dioica*, *Carex acutiformis*, *Iris pseudacorus*, *Typhoides arundinacea*, *Parietaria officinalis*.

Syntaxonomy: in general, the floristic features of this coenosis (frequency of species such as *Brachypodium sylvaticum*, *Clematis viticella*, *Populus nigra*, *Salix alba*, *Sambucus nigra*), actually correspond to those of *Populetalia albae* and *Salici-Populetea nigrae*; in this context, the connection with the *Carici remotae-Fraxinion oxycarpae* is suggested by the occurrence of *Carex remota*, *C. pendula*, *Rumex sanguineus* and *Ulmus minor*, extending nothwards the areal of this alliance.

Synecology: the association develops along the banks of spring water rivers and in depressions among the meso-hygrophilous forest of the alluvial plain (*Asparago tenuifolii-Quercetum roboris*) on moist/wet fine-textured mineral soils that are flooded only during springtime.

Physiognomy and structure: *Fraxinus angustifolia* subsp. *oxycarpa* and sometimes *Populus nigra* form the canopy of the community whilst the lower tree layer is made up of *Ulmus minor*, *Acer campestre* and *Alnus glutinosa*. In the shrub layer *Sambucus nigra*, *Cornus sanguinea* subsp. *hungarica*, *Acer campestre* and *Salix alba* are the most frequent species and *Rubus caesius*, *Carex pendula* and *C. remota* contribute significantly to the physiognomy of the herbaceous cover.

Synchorology: the distribution area of *Lysimachio-Fraxinetum* includes the low alluvial plain of Friuli-Venezia Giulia and Veneto.

Tab. 3 - *Lysimachio nummulariae-Fraxinetum oxycarpae* ass. nova.

Number of relevé	1	2	3	4	5	6	Presence
Number of species	35	31	28	31	30	19	
Diff. species of *Lysimachio nummulariae-Fraxinetum oxycarpae*							
Lysimachia nummularia	+	+	.	1	3	2	5
Leucojum aestivum	1	1	.	.	1	1	4
Urtica dioica	.	1	1	1	+	.	4
Carex acutiformis	1	+	1	+	.	.	4
Iris pseudacorus	+	+	1	.	1	.	4
Typhoides arundinacea	.	+	1	+	.	.	3
Parietaria officinalis	.	+	+	1	.	.	3
Diff. species of *Carici remotae-Fraxinion oxycarpae*							
Fraxinus angustifolia subsp. oxycarpa	4	4	3	3	4	4	6
Carex remota	.	2	+	1	3	2	5
Ulmus minor	.	1	.	2	2	2	4
Carex pendula	1	.	2	+	1	.	4
Rumex sanguineus	.	.	+	+	+	+	4
Populetalia albae and *Salici-Populetea nigrae*							
Sambucus nigra	2	1	.	1	1	+	5
Clematis viticella	+	1	1	.	+	+	5
Populus nigra	1	1	.	1	1	.	4
Brachypodium sylvaticum	+	1	1	+	.	.	4
Salix alba	1	1	2	.	.	.	3
Equisetum telmateja	1	.	.	+	.	.	2
Humulus lupulus	+	.	.	.	+	.	2
Calystegia sepium	+	.	.	.	+	.	2
Geum urbanum	.	.	.	.	+	+	2
Tamus communis	+	.	.	.	.	.	1
Arum italicum	+	.	.	.	.	.	1
Bryonia dioica	+	.	.	.	.	.	1
Cucubalus baccifer	.	.	.	.	+	.	1
Eupatorium cannabinum	+	.	.	.	.	.	1
Other species							
Rubus caesius	2	+	2	3	3	+	6
Acer campestre	+	1	1	1	1	2	6
Cornus sanguinea subsp. hungarica	2	2	2	1	.	+	5
Hedera helix	3	.	2	1	.	+	4
Quercus robur	.	.	1	1	1	1	4
Prunus spinosa	1	.	.	.	+	1	3
Poa sylvicola	.	.	+	+	+	.	3
Alnus glutinosa	3	.	1	.	.	.	2
Platanus hybrida	.	2	1	.	.	.	2
Bidens frondosa	.	.	+	.	2	.	2
Viburnum opulus	.	.	1	1	.	.	2
Filipendula ulmaria	.	+	.	1	.	.	2
Lythrum salicaria	.	.	+	.	+	.	2
Ranunculus repens	.	.	.	.	+	+	2
Accidental species	11	11	5	9	6	3	

Tab. 4 - *Valeriano dioicae-Fraxinetum oxycarpae* ass. nova.

Number of relevé	1	2	3	4	5	6	Presence
Number of species	29	20	25	18	23	20	
Diff. species of *Valeriano dioicae-Fraxinetum oxycarpae*							
Valeriana dioica	1	+	1	+	1	1	6
Thalictrum lucidum	.	+	+	+	+	+	5
Carex flava s.s.	+	.	.	.	1	+	3
Diff. species of *Frangulo alni-Fraxinion oxycarpae*							
Fraxinus angustifolia subsp. oxycarpa	3	3	4	4	4	4	6
Cladium mariscus	1	.	.	.	+	.	2
Alnetalia glutinosae and *Alnetea glutinosae*							
Frangula alnus	2	1	1	1	1	+	6
Galium elongatum	+	1	1	.	1	+	5
Lycopus europaeus	+	.	+	+	+	.	4
Alnus glutinosa	2	2	2	.	.	.	3
Thelypteris palustris	.	+	1	.	+	.	3
Salix cinerea	.	.	.	1	.	.	1
Peucedanum palustre	.	.	+	.	.	.	1
Phragmito-Magnocaricetea							
Carex elata	3	3	3	2	4	4	6
Iris pseudacorus	+	+	1	.	.	+	4
Lythrum salicaria	.	+	+	+	.	+	4
Lysimachia vulgaris	.	.	+	+	.	+	3
Phragmites australis	.	+	.	.	+	+	3
Mentha aquatica	.	.	.	.	1	+	2
Typhoides arundinacea	1	.	.	.	.	.	1
Veronica beccabunga	.	.	.	.	.	+	1
Berula erecta	.	.	.	.	.	+	1
Other species							
Leucojum aestivum	3	3	1	1	2	2	6
Crataegus monogyna	+	+	+	+	+	+	6
Viburnum opulus	+	.	+	1	+	.	4
Cornus sanguinea subsp. hungarica	+	+	+	1	.	.	4
Eupatorium cannabinum	.	+	+	+	+	.	4
Ranunculus repens	+	+	+	.	+	.	4
Populus nigra	1	2	.	1	.	.	3
Rhamnus catharticus	2	1	+	.	.	.	3
Ulmus minor	+	.	+	1	.	.	3
Hedera helix	.	.	.	+	+	+	3
Ruscus aculeatus	.	+	.	.	+	+	3
Valeriana officinalis	1	.	.	+	.	.	2
Caltha palustris	.	.	.	.	1	+	2
Equisetum arvense	1	+	.	.	.	.	2
Clematis viticella	+	.	+	.	.	.	2
Rubus caesius	+	.	+	.	.	.	2
Accidental species	6	0	2	0	3	1	

VALERIANO DIOICAE-FRAXINETUM OXYCARPAE ass. nova *hoc loco* (Tab. 4)

Holotypus: rel. 5 in tab. 4

Differential species: *Valeriana dioica*, *Thalictrum lucidum*, *Carex flava s.s.*.

Syntaxonomy: the high frequency of *Frangula alnus*, *Galium elongatum*, *Lycopus europaeus* and, to a lesser extent, *Alnus glutinosa* and *Thelypteris palustris*, together with a low expression of the *Salici-Populetea nigrae* entities, allow us to refer this association to *Alnetalia* and *Alnetea glutinosae*; the aforementioned phytogeographic features of the association as well as the abundance of *Fraxinus angustifolia* subsp. *oxycarpa* and, in some stands, the occurrence of *Cladium mariscus*, suggest the connection of *Valeriano-Fraxinetum* to *Frangulo alni-Fraxinion oxycarpae*.

Synecology: the community develops on hydromorphic soils with large amounts of slightly decomposed organic matter which are regularly flooded during year.

Physiognomy and structure: *Fraxinus angustifolia* subsp. *oxycarpa* and sometimes *Alnus glutinosa* form the canopy of the community whilst the lower

tree layer is made up of *Alnus glutinosa*, *Populus nigra* and *Ulmus minor*; in the shrub layer *Frangula alnus*, *Crataegus monogyna*, *Viburnum opulus* and *Cornus sanguinea* subsp. *hungarica* are the most frequent species. The herbaceous cover is discontinuous and is mainly made up of dense tussoks of *Carex elata*; this sedge as well as the springtime flowering of *Leucojum aestivum* contribute significantly to characterize the physiognomy of this layer.

Synchorology: the distribution area of the association at present includes narrow areas of the Karst near Monfalcone (Gorizia-Venezia Giulia).

Syntaxonomic scheme

ALNETEA GLUTINOSAE Br.-Bl. et Tüxen ex Westhoff, Dijk et Passchier 1946
ALNETALIA GLUTINOSAE Tüxen 1937
Frangulo alni-Fraxinion oxycarpae Poldini, Sburlino et Venanzoni in Biondi, Allegrezza, Casavecchia, Galdenzi, Gasparri, Pesaresi, Poldini, Sburlino, Vagge et Venanzoni 2015
Valeriano dioicae-Fraxinetum oxycarpae Poldini et Sburlino ass. nova
(Pseudonym: *Leucojo-Fraxinetum* sensu Auct. Ital. non Glavač 1959)

SALICI PURPUREAE–POPULETEA NIGRAE Rivas-Martínez & Cantó ex Rivas-Martínez, Báscones, T.E. Díaz, Fernández-González et Loidi 2001
POPULETALIA ALBAE Br.-Bl. ex Tchou 1948
Carici remotae-Fraxinion oxycarpae Pedrotti ex Pedrotti, Biondi, Allegrezza et Casavecchia in Biondi, Allegrezza, Casavecchia, Galdenzi, Gasparri, Pesaresi, Vagge et Blasi 2014
Lysimachio nummulariae-Fraxinetum oxycarpae Poldini et Sburlino ass. nova
(Pseudonym: *Leucojo-Fraxinetum* sensu Auct. Ital. non Glavač 1959)

List of the syntaxa not quoted in the syntaxonomic scheme

Alnion glutinosae Malcuit 1929; *Alnion incanae* Pawłowski in Pawłowski, Sokołowski et Wallisch 1928; *Alno-Fraxinetalia excelsioris* Passarge 1968; *Alno-Quercion roboris* Horvat 1950; *Asparago tenuifolii-Quercetum roboris* (Lausi 1967) Marinček 1994; *Carici remotae-Fraxinetum oxycarpae* Pedrotti 1970 corr. Pedrotti 1992; *Carici remotae-Fraxinetum oxycarpae iridetosum foetidissimae* Conti et Pirone 1992; *Cladio-Fraxinetum oxycarpae* Piccoli, Gerdol et Ferrari ex Piccoli 1995; *Cladio-Fraxinetum oxycarpae caricetosum otrubae* Stanisci, Presti et Blasi 1998; *Fagetalia sylvaticae* Pawłowski 1928; *Fraxinetalia* Scamoni et Passarge 1959; *Leucojo-Fraxinetum oxycarpae* Glavač 1959 corr. Brullo et Spampinato 1999; *Leucojo-Fraxinetum alnetosum* Glavač 1960; *Rubio peregrinae-Fraxinetum oxycarpae* Pedrotti et Gafta ex Biondi et Allegrezza 2004; *Rubo caesii-Ulmetum minoris* Brullo et Spampinato 1999; *Salici apenninae-Fraxinetum oxycarpae* Allegrezza, Mentoni et Tesei 2010.

References

Allegrezza M., Mentoni M. & Tesei G., 2010. Geomorfologia e paesaggio vegetale: l'esempio della grande frana di Pescacci (comune di Serra San Quirico – Appennino centrale). Fitosociologia 47(2): 57-97.

Biondi E., 2011. Phytosociology today: Methodological and conceptual evolution. Plant Biosystems 145 (Suppl.): 19-29.

Biondi E. & Allegrezza M., 2004. Lettura e modellizzazione sinfitosociologica del paesaggio vegetale del Bacino del Fosso della Selva. In Biondi E. & Allegrezza M. (Eds.). L'ambiente della Selva di Gallignano. Quaderni della Selva 2: 36-57.

Biondi E., Allegrezza M., Casavecchia S., Galdenzi D., Gasparri R., Pesaresi S., Poldini L., Sburlino G., Vagge I. & Venanzoni R. 2015. New syntaxonomic contribution to the Vegetation Prodrome of Italy. Plant Biosystems 149(3): 603-615.

Biondi E., Allegrezza M., Casavecchia S., Galdenzi D., Gasparri R., Pesaresi S., Vagge I. & Blasi C., 2014. New and validated syntaxa for the checklist of Italian vegetation. Plant Biosystems 148(1-2): 318-332.

Biondi E., Casavecchia S. & Radetic Z., 2002. La vegetazione dei "guazzi" e il paesaggio vegetale della pianura alluvionale del tratto terminale del Fiume Musone (Italia centrale). Fitosociologia 39(1): 45-70.

Braun-Blanquet J., 1964. Pflanzensoziologie. 3rd ed. Springer, Wien.

Brullo S. & Spampinato G., 1999. Syntaxonomy of hygrophilous woods of the *Alno-Quercion-roboris*. Ann. Bot. 57: 133-146.

Conti F. & Pirone G., 1992. Le cenosi di *Fraxinus oxycarpa* Bieb. e di *Carpinus betulus* L. del bosco di Vallaspra nel bacino del Fiume Sangro (Abruzzo, Italia). Doc. Phytosoc. n.s., 14: 167-175.

Corbetta F. & Censoni Zanotti A.L., 1974. La foresta Panfilia: caratteristiche fitosociologiche e strutturali. Arch. Bot. Biogeogr. Ital. 19(3-4): 159-170.

Dakskobler I., Kutnar L. & Šilc U., 2013. Poplavni,

močvirni in obrežni gozdovi v Sloveniji. Silva Slovenica, Gozdarski inštitut Slovenije.
Douda J., Boublík K., Slezák M., Biurrun I., Nociar J., Havrdová A., *et al.*, 2015. Vegetation classification and biogeography of European floodplain forests and alder carrs. Applied Vegetation Science 147(1): 147-163.
Géhu J.-M. & Rivas-Martínez S., 1981. Notions fondamentales de phytosociologie. In: Dierschke H. (Ed.). Syntaxonomie. Ber. Intern. Symposium IV–V: 5-53. J. Cramer, Vaduz.
Glavač V., 1959. O šumi poljskog jasena s kasnim drijemovcem (*Leucoieto-Fraxinetum angustifoliae* ass. nova). Šumarski List 83(1-3): 39-45.
Horvat I., 1950. Šumske zajednice Jugoslavije. Institut za šumarska istraživanja. Zagreb.
Horvat I., Glavač V. & Ellenberg H. 1974. Vegetation Südosteuropas. G. Fischer, Stuttgart.
Merloni N. & Piccoli F., 2001. La vegetazione del complesso Punte Alberete e Valle Mandriole (Parco Regionale del Delta del Po - Italia). Braun-Blanquetia 29: 1-17.
Mucina L., Bültmann H., Dierßen K., Theurillat J.-P., Raus T., Čarni A., *et al.*, 2016. Vegetation of Europe: hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. Applied Vegetation Science 19(S1): 3-264.
Pedrotti F., 1970. Un relitto di bosco planiziare a *Quercus robur* e *Fraxinus angustifolia* lungo il Fiume Sinello in Abruzzo. Savini-Mercuri, Camerino: 1-23.
Pedrotti F., 1984. Foreste ripariali lungo la costa adriatica dell'Italia. Coll. Phytosoc. 9 (1980): 143-154.
Pedrotti F. & Cortini Pedrotti C., 1978. Notizie sulla distribuzione del *Carici-Fraxinetum angustifoliae* lungo la costa adriatica (Italia centro-meridionale). Mitteil. Ostalp.-dinar. Ges. Vegetationsk. 14: 255-261.
Pedrotti F. & Gafta D., 1992. Tipificazione di tre nuove associazioni forestali ripariali nell'Italia meridionale. Doc. Phytosoc. n.s. 14: 557-560.
Piccoli F., Gerdol R. & Ferrari C., 1983. Carta della vegetazione del Bosco della Mesola (Ferrara). Atti Ist. Bot. Lab. Critt. Univ. Pavia 3(23) ser. 7(2): 3-23.
Pignatti S., 1982. Flora d'Italia. Edagricole, Bologna.
Podani J., 2001. SYN-TAX 2000. Computer programs for data analysis in ecology and systematics. Scientia Publishing, Budapest.
Poldini L., 1997. Alcune cenosi rare nel Friuli-Venezia Giulia (NE Italia). Gortania 18 (1996): 95-110.
Poldini L., Buffa G., Sburlino G. & Vidali M., 2009. I boschi della Pianura Padana orientale e problemi inerenti alla loro conservazione. Natura Bresciana, Ann. Mus. Civ. Sc. Nat., Brescia 36: 179-184.
Pott R., 2011. Phytosociology: A modern geobotanical method. Plant Biosystems 145 Suppl.: 9-18.
Rauš Đ., 1973. Fitocenološke značajke i vegetacijska karta facultetskih šuma Lubardenik i Opeke. Šumarski List 97(5-6): 190-221.
Rivas-Martínez S., 2005. Notions on dynamic-catenal phytosociology as a basis of landscape science. Plant Biosystems 139: 135-144.
Šilc U. & Čarni A., 2012. Conspectus of vegetation syntaxa in Slovenia. Hacquetia 11(1): 113-164.
Škvorc Ž, Jasprica N., Alegro A., Kovačić S., Franjić J., Krstonošić D., Vraneša A. & Čarni A., 2017. Vegetation of Croatia: Phytosociological classification of the high-rank syntaxa. Acta Bot. Croat. 76(2): 200-224.
Stanisci A., Presti G. & Blasi C., 1998. I boschi igrofili del Parco Nazionale del Circeo (Italia Centrale). Ecologia Mediterranea 24(1): 73-88.
Trinajstić I., 2008. Biljne zajednice Republike Hrvatske – Plant communities of Croatia. Akademija šumarskih znanosti. Zagreb.
Tutin T.G., Heywood V.H, Burges N.A., Valentine D.H., Walters S.M. & Webb D.A. (Eds.), 1964-1980. Flora Europaea. Cambridge University Press, Cambridge.
Vukelić J., 2012. Šumska vegetacija Hrvatske. Sveučilište u Zagrebu, Šumarski fakultet & Državni zavod za zaštitu prirode. Zagreb.

Appendix I: Locations and sources of the relevés

Tab. 3 - rel. 1: rel. 1 of Tab. 4 in Poldini (1997), Laghetti delle Noghere (Muggia, Trieste); rel. 2: Flambruzzo (Rivignano, Udine), L. Poldini; rel. 3: Ariis (Rivignano, Udine), L. Poldini; rel. 4: Villa Bombarda (Portogruaro, Venezia), L. Poldini; rels. 5, 6: Bosco di Lison (Portogruaro, Venezia), L. Poldini and G. Sburlino.
Tab. 4 - rels. 1, 2, 3, 5, 6: Palude Sablici (Monfalcone, Gorizia), L. Poldini; rel. 4: Lago di Doberdò (Monfalcone, Gorizia), L. Poldini.

Appendix II: Accidental species

Tab. 3 - rel. 1 Ajuga reptans, Asparagus acutifolius, Carex elata (1), Crataegus monogyna, Ligustrum vulgare, Lonicera caprifolium, Phragmites australis, Prunus avium, Ruscus aculeatus, Salix cinerea, Sorbus torminalis; rel. 2: Caltha palustris, Corylus avellana (1), Equisetum arvense, Euonymus europaeus, Festuca gigantea (1), Polygonum mite, Prunus padus (1), Rumex conglomeratus, Valeriana dioica, Valeriana officinalis, Veratrum album subsp. lobelianum; rel. 3: Angelica sylvestris (1), Dactylis glomerata, Galium palustre aggr. (1), Polygonum minus (2), Rubus ulmifolius (1); rel. 4: Aegopodium podagraria (1), Carex sylvatica, Circaea lutetiana (2), Duchesnea indica (1), Galium aparine, Lamium maculatum, Lamium orvala, Symphytum officinale, Viola reichenbachiana; rel. 5: Carex otrubae, Carex riparia, Crataegus laevigata (1), Gladiolus imbricatus, Morus nigra (1), Polygonum persicaria (1); rel. 6: Ficaria verna (2), Ranunculus auricomus aggr. (1), Rhamnus catharticus.
Tab. 4 - rel. 1: Acer campestre (1), Humulus lupulus, Ligustrum vulgare, Prunella vulgaris (1), Serratula tinctoria (1), Symphytum officinale; rel. 3: Calystegia sepium, Molinia caerulea (2); rel. 5: Euonymus europaeus, Juncus articulatus, Viola elatior; rel. 6: Solanum dulcamara.