

## SYNTAXONOMY OF HYGROPHILOUS WOODS OF THE ALNO-QUERCION ROBORIS

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ABSTRACT - A syntaxonomical revision of the hygrophilous woods occurring in marshy places of the flood-plains from SE Europe is given. This vegetation is included in the *Alno-Quercion roboris*, alliance of the *Populetalia albae*, which comprises numerous associations characterized by the dominance of hard-wood trees, such as *Quercus robur*, *Fraxinus oxycarpa*, *Ulmus minor*, *Alnus glutinosa*, etc. For each association the synonyms, nomenclature type, diagnostic species, ecology, structure and chorology are given.

KEY WORDS - Phytosociology, syntaxonomy, *Alno-Quercion roboris*.

### INTRODUCTION

In the framework of the project "European Vegetation Survey", the hygrophilous woods linked to a variably prolonged flooded period, are examined. These woods are localized mainly in marshy places of the fluvial bends and mouths as well as in the flood-plains.

The canopy of these woods is characterised by the dominance of hard-wood trees, such as *Quercus robur*, *Alnus glutinosa*, *Fraxinus oxycarpa* (= *F. angustifolia*), *Ulmus minor* or, more rarely, *Ulmus procera* and *Fraxinus pallisae*. Therefore they are floristically and physiognomically well differentiated from the typical riparian woods growing along the riversides submerged during seasonal inundation only, where the canopy is represented mainly by *Salix* sp. pl., *Populus* sp. pl. or sometimes by *Platanus orientalis*.

From the literature data, these hygrophilous woods are mainly distributed in the S-E Europe and in particular they are well represented in Hungary, Albania, Bulgaria, Romania, Yugoslavia, Italy and, more rarely, in France.

The previous authors, which examined these tree communities, referred them to different alliances, as, for instance, *Alnion incanae* (Horvat, 1938), *Alno-Quercion roboris* (Horvat, 1950), *Lauro-Fraxinion oxycarpae* (Kárpáti and Kárpáti, 1961), *Fraxinion angustifoliae* (Pedrotti, 1970; 1984; Pedrotti and Cortini Pedrotti, 1978;

Dierschke, 1984; Gellini *et al.*, 1986), *Populion albae* (Pedrotti and Gafta, 1996), *Alno-Ulmion* (Oberdorfer, 1953; Pedrotti and Gafta, 1996), *Alnion glutinosae* (Pedrotti and Gafta, 1996), *Alno-Padion* (Dierschke, 1984). These different syntaxonomical approaches emphasize the critical phytosociological position of this vegetation.

In the attempt to clarify this problems, a great part of the published relevés have been analysed from the floristic, ecological and structural point of view.

#### MATERIAL AND METHODS

The syntaxonomical analysis was carried out on relevés and synoptic tables taken from various literature sources (Horvat, 1938; Soó, 1957; Simon, 1957; Glavac, 1959, 1968, 1969; Kárpáti & Kárpáti, 1961; Krausch, 1965; Pedrotti, 1970; Horvat *et al.*, 1974; Corbetta & Censoni Zanotti, 1974, 1981; Pedrotti & Cortini, 1978; Piccoli & Gerdol, 1984; Sartori, 1984; Rameau & Schmitt, 1984; Piccoli *et al.*, 1985; Gellini *et al.*, 1986; Gehu & Biondi, 1989; Conti & Pirone, 1992; Pedrotti & Gafta, 1993; Brullo & Spampinato, 1997; Stanisci *et al.* 1998). Some unpublished data have been taken into consideration too. The synthetic table (tab. 1) and the syntaxonomy were constructed according to the principles exposed in Braun-Blanquet's (1964) approach and by following the phytosociological nomenclatural code (Barkman *et al.*, 1986). The nomenclature of species follows Tutin *et al.* (1964-1993).

#### RESULTS AND DISCUSSION

On the basis of literature data and personal field investigations, it was possible to verify that the marsh hard-wood forests show a remarkable autonomy, if compared to the other hygrophilous woodlands. In particular, they are closely related to the boreal alder-carrs belonging to *Alnetea glutinosae*, but they differ clearly from floristical and structural point of view. For its floristic and ecological peculiarities, these woodlands must be included within an independent alliance of the *Populetalia albae*, represented by the *Alno-Quercion roboris*, considered at times by some authors as a suballiance of *Alno-Ulmion* or *Alno-Padion* (Oberdorfer, 1953; Dierschke, 1984).

The *Alno-Quercion roboris* was first described by Horvat (1937) as *nomen nudum* and successively considered by the same author (Horvat, 1938) as synonym of *Alnion incanae* Pawl. 1928. Finally, Horvat (1950) validly described this syntaxon. According to Brullo & Spampinato (1997), all the following syntaxa should be considered as synonyms of the above-mentioned alliance: *Lauro-Fraxinion oxycarpae* I. & V. Kárpáti 1961, *Fraxinion angustifoliae* Pedrotti 1970, and *Ulmion* Oberdorfer 1953.

The diagnostic species of the *Alno-Quercion roboris* are the followings: *Quercus robur*, *Fraxinus oxycarpa*, *F. pallisae*, *Ulmus minor*, *U. procera*, *Leucojum aestivum*, *Periploca graeca*, *Carex divulsa*, *C. elongata*, *C. brizoides*, *C. strigosa*, *Clematis viticella*, *Cerastium sylvaticum*, *Genista elata*, *Laurus nobilis*, *Moeringia trinervia*. All these species show an important role in this type of vegetation either for their high frequency or because of their exclusiveness.

The *Alno-Quercion roboris*, for its structure and composition, can be included in the *Populetalia albae*, belonging to the class *Querco-Fagetea*, as confirmed by the occurrence of numerous characteristic species of this order, such as *Populus alba*, *P. nigra*, *Alnus glutinosa*, *Salix alba*, *Vitis sylvestris*, *Viburnum opalus*, *Sambucus nigra*, *Ficus carica*, *Carex remota*, *Rumex sanguineus*, *Solanum dulcamara*, *Carex pendula*, *Rubus caesius*, *Arum italicum*, *Equisetum telmateja*, *Scrophularia nodosa*, *Humulus lupulus* etc.

According to the literature data, the associations of the *Alno-Quercion roboris*, as emphasized in fig. 1, 2, occur in Hungary (Horvat *et al.*, 1974), Albania (Kárpáti

& Kárpáti, 1961), Bulgaria (Soó, 1957), Romania (Simon, 1957; 1960; Krausch, 1965), Yugoslavia (Horvat, 1937; 1938; 1950; Horvat *et al.*, 1974; Glavac, 1959; 1968; 1969), France (Rameau & Schmitt, 1984) and Italy (Pedrotti, 1970; Corbetta & Censoni Zanotti, 1974; 1981; Pedrotti & Cortini, 1978; Piccoli & Gerdol, 1984; Piccoli *et al.*, 1985; Gellini *et al.*, 1986; Gehu & Biondi, 1989; Conti & Pirone, 1992; Pedrotti & Gafta, 1993; 1996; Brullo & Spampinato, 1997; Sartori, 1984; Stanisci *et al.* 1998).

The syntaxonomical analysis of hygrophilous woodlands of *Alno-Quercion roboris* allows us to propose the following scheme:

**QUERCO-FAGETEA** Br.-Bl. & Vlieger in Vlieger 1937, Nederl. Kruidk., Arch. 47: 349.

**Populetalia albae** Br.-Bl. ex Tchou 1948, Vegetatio 1(1): 19.

***Alno-Quercion roboris*** Horvat 1950, Inst. Sum. Istraz. Zagreb: 41.

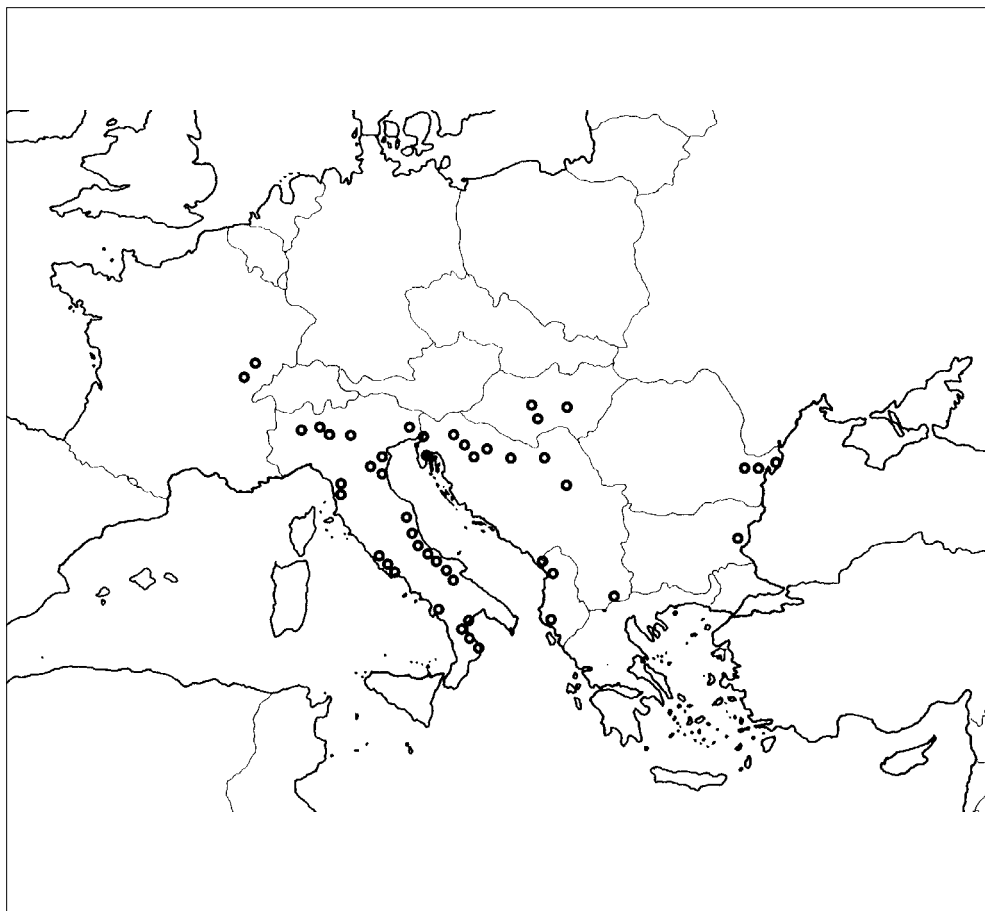


Fig.1 - Distribution of the communities belonging to the *Alno-Quercion roboris* in SE-Europe.



- Lectotype: *Genisto elatae-Quercetum roboris* Horvat 1938, Glas. Sum. Pok. Zagreb 6: 278, hoc. loco.  
 (sub *Querceto-Genistetum elatae*)  
 Syn.: *Alno-Quercion roboris* Horvat 1937, Sum. List. Zagreb 61: 340, nom. inval. (art. 2b).  
*Alno-Quercion roboris* Horvat 1938, Glas. Sum. Pok. Zagreb 6: 271, nom. inval. (art. 3a).  
*Alnion incanae* Horvat 1938, Glas. Sum. Pok. Zagreb 6: 271, non Pawl 1928.  
*Ulmenion* Oberdorfer 1953, Beitr. Naturk. Forsch. Sudw.-Deutsch. 12: 61.  
*Lauro-Fraxinion oxycarpae* I. & V. Kárpáti 1961, Acta Bot. Acad. Sci. Hung. 7: 254  
 (sub *Lauro-Fraxinion angustifoliae*)  
*Fraxinion angustifoliae*, Pedrotti 1970, Ist. Bot. Univ. Camerino: 16, nom. inval. (art. 3b).  
 Diagnostic species: *Quercus robur*, *Fraxinus oxycarpa*, *F. pallisae*, *Ulmus minor*, *U. procera*, *Leucojum aestivum*, *Periploca graeca*, *Carex brizoides*, *C. elongata*, *C. divulsa*, *C. strigosa*, *Clematis viticella*, *Laurus nobilis*, *Moeringia trinervia*, *Genista elata*, *Cerastium sylvaticum*.  
 Structure and Ecology: marsh hard-wood forests characterized by dominance of bay oak (*Quercus robur*), elm (*Ulmus minor*), flowering ash (*Fraxinus oxycarpa*) and alder (*Alnus glutinosa*).  
 Chorology: Italy, France, Croatia, Slovenia, Hungary, Romania, Bulgaria, Albania
- 1 - *Genisto elatae-Quercetum roboris*** Horvat 1938, Glas. Sum. Pok. Zagreb 6: 278, nom. inver.  
 (sub *Querceto-Genistetum elatae*)  
 Lectotype: ril.12, tab.6, Horvat 1938, hoc loco.  
 Syn.: *Querco-Ulmetum slavonicum* Soó 1957 Ann. Univ. Sci. Budapest, Sect Biol., 1: 232, nom. illeg. (art. 34)  
 Diagnostic species: *Genista elata*, *Pseudostellaria europaea*.  
 Structure and Ecology: marsh forest occurring in flooded plains along the continental rivers. The canopy is characterized by the dominance of *Quercus robur*.  
 Chorology: Slavonia (Horvat, 1937, 1938, 1950; Glavac, 1969; Oberdorfer, 1953; Horvat *et al.*, 1974)
- 2 - *Carici brizoidis-Alnetum glutinosae***, Horvat 1938, Glas. Sum. Pok. Zagreb 6: 277.  
 (sub *Alnus glutinosa-Carex brizoides* ass.)  
 Lectotype: rel. 1, tab. 5, Horvat (1938), hoc loco.  
 Diagnostic species: *Salix aurita*, *Carex brizoides*.  
 Structure and Ecology: alder-carrs linked to damp depressions of the continental plains. The canopy is characterized by the dominance of *Alnus glutinosa*, which goes with *Quercus robur*.  
 Chorology: Croatia (Horvat, 1937, 1938, 1950; Oberdorfer, 1953), Italy (Bracco *et al.*, 1985; Pedrotti & Gafta, 1996).
- 3 - *Querco roboris-Carpinetum betuli*** (Soó ex Balacs 1943) Horvat, Glavac & El-lemberg 1974, Geobot. Select. 4: 295.  
 Lectotype: to appoint.  
 Syn.: *Querco-Carpinetum hungaricum* Soó ex Balacs 1943, Acta Geobot. Hung. 5: 388, nom. illeg. (art. 34).  
*Querco-Ulmetum bulgaricum* Soó 1957 Ann. Univ. Sci. Budapest, Sect Biol.,

1: 233, nom illeg. (art. 34).

*Quercus-Carpinetum banaticum* Pascal ex Borza 1962, Probl. Biol. Acad. R.P.R. : 248 nom illeg. (art. 34).

*Quercus roboris-Carpinetum betuli submediterraneum* Bertovic ex Horvat et al. 1974, Geobot. Select. 4: 206. nom. illeg. (art. 34).

*Quercus-Carpinetum croaticum* Glavac 1968, Feddes Repert 79: 121, non Horvat 1938.

Diagnostic species: *Carpinus betulus*, *Acer campestre*.

Structure and Ecology: hygrophilous forests linked to damp soils, temporarily submerged, of the wide continental plains, characterized by *Carpinus betulus* and *Quercus robur*, usually associated to *Ulmus minor*, *Alnus glutinosa* and *Fraxinus oxycarpa*.

Chorology: Bulgaria, Istria, Hungary, Romania, Italy (Simon, 1957; Soó, 1957; Glavac, 1958; Borza, 1962; Pedrotti, 1970; Horvat et al., 1974; Poldini, 1989).

**4 - *Pruno padii-Alnetum glutinosae* ass. nov.**

Holotype: ril.: 15, tab. 1, Glavac 1975.

Syn.: *Pruno-Fraxinetum* südosteuropäische rasse Horvat et al. 1974, Geobot. Selecta 4: 381.

*Pruno-Fraxinetum* Horvat et al. 1974, Geobot. Selecta 4: 383, non Oberd. 1953.

*Pruno-Fraxinetum* Glavac 1975, Beitr. Naturk Forsch. Süd.-Dtl, 34: 95, non Oberd. 1953.

Diagnostic species: *Prunus padus*.

Structure and Ecology: alder-carrs growing on damp soils temporarily submerged, along continental rivers, physiognomically characterised by *Prunus padus* and *Fraxinus oxycarpa*.

Chorology: Croatia, Slovenia (Glavac, 1975; Horvat et al., 1974).

**5 - *Oenanthe banatici-Quercetum roboris* (Soó 1955) Brullo & Spampinato nom. nov.**

Lectotype: to appoint.

Syn.: *Quercus-Ulmetum hungaricum* Soó 1955, Acta Bot. Acad. Hung. 1: 317. nom. illeg. (art. 34)

Diagnostic species: *Oenanthe banatica*, *Deschampsia parviflora*.

Structure and Ecology: marsh forests dominated by *Quercus robur*, occurring on sandy soils of continental area and playing the role of glacial relict.

Chorology: Hungary (Soó, 1955; Simon, 1957).

**6 - *Leucojo aestivi-Fraxinetum oxycarpae* Glavac 1959, Sum. List. Zagreb, 1-3: 40, corr.**

(sub. *Leucojo-Fraxinetum angustifoliae*).

Lectotype: rel. 15, tab. 1, Glavac 1959, hoc loco.

Syn.: *Leucojo-Fraxinetum parvifoliae* Horvat et al. 1974, Geobot. Selecta 4: 375.

Diagnostic species: *Leucojum aestivum*, *Cardamine dentata*, *Teucrium scordium*.

Structure and Ecology: marsh forests growing on the floor of very deep depressions with soil always submerged, characterized by the dominance of *Fraxinus oxycarpa*.

- Chorology: Croatia (Glavac, 1959; Horvat *et al.*, 1974).
- 7 - *Quercetum robori-pedunculiflorae*** Simon 1960, Ann. Univ. Sci. Budapest, sect. Biol., 3:317.  
 Holotype: rel. pag. 317, Simon 1960.  
 Syn.: *Quercetum-Ulmetum leteense* Simon 1960, Ann. Univ. Sci. Budapest, sect. Biol., 3:320. *Fraxinetum pallisae* subass. *quercetosum pedunculiflorae* Krausch 1965, Limnologica 3(3): 283.  
 Diagnostic species: *Quercus pedunculiflora*, *Polygonatum latifolium*.  
 Structure and Ecology: marsh forests localized in sandy coastal depression near the Danube delta, characterized by the dominance of *Quercus pedunculiflora*, which is associated with *Q. robur*.  
 Chorology: Romania (Simon, 1960; Krausch, 1965).
- 8 - *Lauro nobilis-Fraxinetum oxycarpae*** I. & V. Kárpáti 1961, Acta Bot. Acad. Sci. Hung. 7:254, corr.  
 (sub. *Lauro-Fraxinetum angustifoliae*).  
 Lectotype: rel. 3, tab. 5, I. & V. Kárpáti 1961, hoc loco.  
 Syn.: *Lauro nobilis-Fraxinetum oxycarpae* Pedrotti & Gafta 1992, Doc. Phytosoc. n.s. 14:558, nom. illeg. (art. 31).  
 Diagnostic species: *Laurus nobilis*, *Rubia tinctoria*, *Euonimus latifolia*.  
 Structure and Ecology: Mediterranean hygrophilous forests growing on periodically submerged soils of the coastal plains near to the river, physiognomically dominated by *Fraxinus oxycarpa*, usually associated to *Quercus robur* and *Ulmus minor*.  
 Chorology: Albania, Italy (Kárpáti & Kárpáti, 1961; Arrigoni, 1990; Pedrotti & Gafta, 1993)
- 9 - *Aristolochio rotundae-Alnetum glutinosae*** (I. & V. Kárpáti) nom. nov.  
 Syn.: *Alno-Fraxinetum angustifoliae* I. & V. Kárpáti 1961, Acta Bot. Acad. Sci. Hung. 7: 246, nom illeg. (art. 31, 32)  
*Alno-Fraxinetum oxycarpae* I. Kárpáti 1962, Mitt. Ostalp.-din. Pflanzensoz. Arbeit. 2: 102, non Tchou 1948, nom illeg. (art. 31).  
 Lectotype: rel. 1, tab. pg. 248, I. & V. Kárpáti 1961, hoc loco.  
 Diagnostic species: *Aristolochia rotunda*, *Ulmus procera*.  
 Structure and Ecology: Mediterranean hygrophilous forests occurring on inundated soils localised in the inner plains near the rivers, characterized by the prevalence of *Alnus glutinosa*, generally associated to *Fraxinus oxycarpa* and *Populus alba*.  
 Chorology: Albania (Kárpáti & Kárpáti, 1961; Kárpáti, 1962).
- 10 - *Echinodoro-Fraxinetum oxycarpae*** I. & V. Kárpáti 1961, Acta Bot. Acad. Sci. Hung. 7:244  
 (sub. *Echinodoro-Fraxinetum angustifoliae*)  
 Lectotype: rel. 1, tab. 2, I. & V. Kárpáti 1961, hoc loco.  
 Diagnostic species: *Echinodorus ranunculoidis*  
 Structure and Ecology: Mediterranean marshy forests linked to long time inundate surfaces and characterized by the dominance of *Fraxinus oxycarpa*, which is associated to several herbaceous hydrophytes.  
 Chorology: Albania (Kárpáti & Kárpáti, 1961).
- 11 - *Junco acuti-Fraxinetum oxycarpae*** I. & V. Kárpáti 1961, Acta Bot. Acad. Sci. Hung. 7:246

(sub. *Junco acuti-Fraxinetum angustifoliae*)

Lectotype: rel. 2, tab. 3, I. & V. Kárpáti 1961, hoc loco.

Diagnostic species: *Agrostis frondosa*, *Cynanchum acutum*, *Juncus acutus*, *Juncus maritimus*, *Agropyron litorale*.

Structure and Ecology: Mediterranean sub-halophilous marshy forests localized in retro-dunal plains on sandy soils, characterized by the dominance of *Fraxinus oxycarpa* and *Alnus glutinosa* associated to several helophytes.

Chorology: Albania (Kárpáti & Kárpáti, 1961)

**12 - *Fraxinetum pallisae*** Krausch 1965 *Limnologica* 3(3): 282.

Lectotype: rel. 2, tab. 3, Krausch 1965, hoc loco.

Diagnostic species: *Salix cinerea*, *Loranthus europaeus*, *Fraxinus pallisae*.

Structure and Ecology: marsh forests localized in coastal depression always submerged near to the Danube delta, characterized by the dominance of *Fraxinus pallisae* associated to *Quercus robur*.

Chorology: Romania (Krausch, 1965).

**13 - *Carici remotae-Fraxinetum oxycarpae*** Pedrotti 1970, *Ist. Bot. Univ. Camerino*: 12

(sub. *Carici-Fraxinetum angustifoliae*)

Lectotype: ril.1, tab. 2, Pedrotti 1970 (Pedrotti 1992)

Diagnostic species: *Carex remota*

Structure and Ecology: Lowland Mediterranean hygrophilous forests characterized by the dominance of *Fraxinus oxycarpa* generally associated to *Ulmus minor* or, more rarely, to *Quercus robur*, occurring on muddy soils localized in inland plains near to the rivers and in coastal plain, temporarily inundated during the winter.

Chorology: Italy (Pedrotti, 1970, 1995; Gellini *et al.*, 1986; Pedrotti & Cortini, 1978; Gehu & Biondi, 1989; Arrigoni, 1990; Lucchese & Pignatti, 1990; Conti & Pirone, 1992; Petriccione & Pani, 1992; Pedrotti & Gafta, 1996)

**14 - *Fraxino-Quercetum roboris*** Gellini, Pedrotti & Venanzoni 1986, *Doc. Phytosoc.* n.s.10(2):35.

Holotype: rel. 14, tab. 3, Gellini, Pedrotti & Venanzoni 1986.

Diagnostic species: *Iris foetidissima*, *Luzula forsterii*, *Moeringia trinervia*, *Veronica montana*.

Structure and Ecology: Hygrophilous Mediterranean forests localized in retro-dunal depressions on hydromorphic soils, occasionally submerged, characterized by the dominance of *Quercus robur* associated to *Fraxinus oxycarpa* and sometimes to *Ulmus minor* and *Populus alba*.

Chorology: Italy (Padula 1985, Gellini *et al* 1986, Manzi 1992, Pedrotti & Gafta 1996, Brullo & Spampinato 1997)

**15 - *Hydrocotylo-Alnetum glutinosae*** Gellini, Pedrotti & Venanzoni 1986, *Doc.*

*Phytosoc.* n.s. 10(2): 29

Holotype: rel. 26, tab. 1, Gellini, Pedrotti & Venanzoni 1986.

Diagnostic species: *Hydrocotyle vulgaris*, *Thelypteris palustris*.

Structure and Ecology: marsh forests on organic permanently flooded soils localized in coastal depressions among the dunes, characterized by the dominance of *Alnus glutinosa*, generally associated to *Fraxinus oxycarpa* and to several hydrophytes.

Chorology: Italy (Gellini *et al* 1986, Arrigoni 1990, Petriccione & Pani 1992, Pedrotti & Gafta 1996)



- 16 - *Cladio-Fraxinetum oxycarpae*** Piccoli, Gerdol & Ferrari ass. nov.  
 Holotype: rel. 3, tab. 1, Piccoli, Gerdol & Ferrari 1985,  
 Syn.: *Carici-Fraxinetum angustifoliae* Piccoli & Gerdol 1984, Coll. Phytosoc. 9:  
 164, non Pedrotti 1970.  
*Cladio-Fraxinetum oxycarpae* Piccoli, Gerdol & Ferrari 1985, Atti Ist. Bot.  
 Lab.  
 Critt. Univ. Pavia, s.7, 2: 6, nom inval. (art. 5).  
 Diagnostic species: *Cladium mariscus*, *Carex acutiformis*, *Carex distans*.  
 Structure and Ecology: Mediterranean marshy forest localized in inter-dunal de-  
 pressions and coastal lakes on sandy soils flooded for a relatively long time,  
 characterized by the dominance of *Fraxinus oxycarpa* in the canopy, associated  
 to *Ulmus minor*, *Quercus robur* and *Populus alba*.  
 Chorology: Italy (Piccoli & Gerdol 1984, Piccoli *et al.* 1985, Pedrotti 1995, Pe-  
 drotti & Gafta 1996, Stanisci *et al.* 1998)
- 17 - *Rubo caesii-Ulmetum minoris*** Brullo & Spampinato ass. nov.  
 Holotype: rel. 4, tab. 1, Corbetta & Censoni Zanotti 1974, hoc loco.  
 Syn.: *Carici-Fraxinetum angustifoliae* Corbetta & Censoni Zanotti 1974, Arch.  
 Bot. Biogeogr. Ital. 50: 165, non Pedrotti 1970.  
 Diagnostic species: *Rubus caesius*, *Prunus spinosa*.  
 Structure and Ecology: hygrophilous forests localized in marshy river loops of inner  
 lowlands, with the canopy characterized by *Ulmus minor*, *Quercus robur* and  
*Fraxinus oxycarpa*.  
 Chorology: Italy (Corbetta & Censoni Zanotti 1974, Ferrari & Speranza 1984)
- 18 - *Clematido viticellae-Populetum albae*** Brullo & Spampinato 1997, Lazaroa,  
 18:123.  
 Holotype: ril.2, tab. 3, Brullo & Spampinato 1997.  
 Diagnostic species: *Clematis viticella*, *Iris pseudacorus*.  
 Structure and Ecology: Mediterranean marsh forests occurring on sandy soils in  
 retro-dunal depressions, periodically flooded, dominated by *Populus alba*.  
 Chorology: Italy (Brullo & Spampinato, 1997)
- 19 - *Polygonato multiflora-Quercetum roboris*** Sartori ass. nov.  
 Holotype: rel. 2, tab.1, Sartori 1984, hoc loco.  
 Syn.: *Polygonato multiflora-Quercetum roboris* Sartori 1984, Coll. Phytosoc. 9:  
 204, nom. inval. (art. 5).  
 Diagnostic species: *Convallaria majalis*, *Polygonatum multiflorum*, *Asparagus*  
*tenuifolius*, *Galeopsis pubescens*, *Aristolochia clematis*.  
 Structure and Ecology: hygrophilous forests localized in muddy soil discontinuou-  
 sly flooded of the river lowlands, characterized by the dominance of *Quercus*  
*robur* associated to *Ulmus minor*, *Carpinus betulus*, *Prunus avium* and *Acer*  
*campestre*.  
 Chorology: Italy (Sartori 1984, Corbetta & Zanotti Censoni 1981, Pedrotti & Gafta  
 1996)
- 20 - *Ulmo laevis-Fraxinetum oxycarpae*** Rameau & Schmitt ass. nov.  
 Holotype: ril.477, tab.1, Rameau & Schmitt 1984, hoc loco.  
 Syn.: *Ulmo laevis-Fraxinetum oxycarpae* Rameau & Schmitt. 1984 Coll. Phyto-  
 soc 9: 97, nom. inval. (art. 5).  
 Diagnostic species: *Ulmus laevis*, *Fraxinus excelsior*, *Fraxinus excelsior x oxy-*  
*carpa*.  
 Structure and Ecology: hygrophilous forests localized in periodically flooded marshy  
 depressions along the rivers and characterized by *Ulmus laevis*, *Fraxinus oxycarpa*,  
*F. excelsior*, and *Quercus robur*.

Chorology: France (Rameau & Schmitt 1984).

**21 - *Veronico-Quercetum roboris*** Stanisci, Presti & Blasi 1998, Ecol. Medit. 24: 79

Holotype: ril.9, tab. 1, Stanisci *et al.* 1998.

Diagnostic species: *Veronica scutellata*, *Juncus conglomeratus*, *Oenanthe aquatica*, *Glyceria fluitans*.

Structure and Ecology: marsh forests localized in coastal depressions on hydromorphic sandy soils, periodically flooded, characterised by the dominance of *Quercus robur*, generally associated to *Fraxinus oxycarpa*. This association comes into contact with the turkey oak woods of *Teucro siculi-Quercetum cerridis*

Chorology: Italy (Padula 1985, Stanisci *et al.* 1998).

#### REFERENCES

- ARRIGONI P.V., 1990 – *Flora e vegetazione della Macchia Lucchese di Viareggio (Toscana)*. Webbia **44**: 1-62.
- BALACS F., 1943 – *Nagykároly és Erdöd környékének erdői*. Acta Geobot. Hung. **5**: 353-398.
- BARKMAN J.J., MORAVEC J. and RAUSCHSCHERT S., 1986 – *Code of Phytosociological nomenclature*. Ed.2. Vegetatio **67**: 145-195.
- BORZA A. 1962 – *La flore et la végétation de la forêt de Soca (Banloc) au Banat*. Probl. Biol. Acad. R.P.R.: 203-297.
- BRACCO F., SARTORI F. and TERZO V., 1985 – *Indagine geobotanica per la valutazione di un'area della bassa Padania occidentale*. Atti Ist. Bot. E Lab. Critt. S.7, **3**: 5-50.
- BRAUN-BLANQUET J., 1964 – *Pflanzensoziologie*. Wien, New York, 1-865.
- BRULLO S. and SPAMPINATO G., 1997 – *Indagine fitosociologica sulle ripisilve della Calabria*. Lazaroa **18**: 105-151.
- CONTI F. and 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. **14**: 167-175.
- CORBETTA F. and CENSONI-ZANOTTI A. L., 1974 – *La foresta Panfilia: caratteristiche fitosociologiche e strutturali*. Arch. Bot. e Biogeograf. Ital. **19**: 159-170.
- CORBETTA F. and ZANOTTI-CENSONI A. L., 1981 – *Il bosco relitto di Cusago*. Not. Fitosoc. **17**: 27-32.
- DIERSCHKE H., 1984 – *Zur syntaxonomischen Stellung und Gliederung der Ufer und Auenwälder Südeuropas*. Coll. Phytosoc. **9**: 115-129.
- FERRARI C. and SPERANZA M., 1984 – *Ecological inferences from phytosociological data in an alluvial forest on the Po Plaine*. St. Geobot. **4**: 41-47.
- GEHU J.-M. and BIONDI E., 1989 – *Donnees sur la végétation des ceintures d'atterrissement des lacs Alimini (Salento, Italie)*. Doc. Phytosoc. **11**: 353-380.
- GELLINI R., PEDROTTI F. and VENANZONI R., 1986 – *Le associazioni forestali ripariali e palustri della Selva di San Rossore (Pisa)*. Doc. Phytosoc. **10** (2): 27-41.
- GLAVAC V., 1959 – *Über die Waldgesellschaft der spitzblättrigen Esche und der Sommerknotenblume (Leucoio-Fraxinetum angustifoliae ass. nov.)*. Sum. List Zagreb **1-3**: 39-45.
- GLAVAC V., 1968 – *Über Eichen-Hainbuchenwälder Kroatiens*. Feddes Repert. **79**: 115-138.
- GLAVAC V., 1969 – *Über die Stieleichen-Auenwälder der Save-Niederung*. Schr. Reihe Vegetationskd. **4**: 103-108.
- GLAVAC V., 1975 – *Das Pruno-Fraxinetum Oberdorfer 53 in Nordwestkroatien*. Beitr. Naturk. Forsch. Süd.-Dtl. **34**: 95-101.
- HORVAT I., 1937 – *Pregled sumske vegetacije u Hrvatsko*. Sum. List Zagreb **61**: 337-344.
- HORVAT I., 1938 – *Biljnosciosloska istrazivanja suma u Hrvatskoj*. Glas. Sum. Pok. Zagreb **6**: 127-279.
- HORVAT I., 1950 – *Sumske zajednice Jugoslavije*. Inst. Sum. Istraz. Zagreb. 1-73.
- HORVAT I., GLAVAC V. and ELLENBERG H., 1974 - *Vegetation Südosteuropas*. Geobot. selecta **4**: 1-768,

## Stuttgart

- KÁRPÁTI I., 1962 – Überblick der zöologischen und ökologischen Verhältnisse der Auenwälder des Westbalkans. Mitt. Ostalp.-din. Pflanzensoz. Arbeit. **2**: 101-106.
- KÁRPÁTI I. and KÁRPÁTI V., 1961 – *Die zöologischen verhältnisse der Auenwälder*. Acta Bot. Acad. Sci. Hung. **7**: 235-301.
- KRAUSCH H.D., 1965 – *Vegetationskundliche Beobachtungen im Donaudelta*. Limnologica **3**: 271-313.
- LAUSI D., 1967 – *Zur Klimax-frage der friaulischen Ebene*. Mitt. Ost.-Din. Pflanzensoz. Arbeit. **7**: 41-46.
- LUCCHESI F. and PIGNATTI S., 1990 – *Sguardo sulla vegetazione del Lazio marittimo*. Acc. Naz. Lincei **264**: 5-48.
- MANZI A., 1992 – *I boschi ripariali lungo il Fiume Osento (Abruzzo-Italia centrale)*. Doc. Phytosoc. n.s. **14**: 115-121.
- OBERDORFER E., 1953 – *Der europäische Auenwald*. Beitr. Naturk. Forsch. Sudw.-Deutsch. **12**: 23-69.
- PADULA M., 1985 – *Aspetti della vegetazione del Parco Nazionale del Circeo*. Webbia **39** (1): 29-110.
- PEDROTTI F., 1970 – *Un relitto di bosco planiziale a Quercus robur e Fraxinus angustifolia lungo il Fiume Sinello in Abruzzo*. Camerino, 1-23.
- PEDROTTI F., 1984 – *Foreste ripariali lungo la costa adriatica dell'Italia*. Coll. Phytosoc. **9**: 143-154.
- PEDROTTI F., 1992 – *Tipificazione e correzione dell'associazione Carici-Fraxinetum angustifoliae Pedrotti 1970*. Doc. Phytosoc. **14**: 165-166.
- PEDROTTI F., 1995 – *La vegetazione forestale italiana*. Atti Conv. Lincei **115**: 39-78.
- PEDROTTI F. and 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. and GAFTA D., 1993 – *Tipificazione di tre nuove associazioni forestali ripariali nell'Italia meridionale*. Doc. Phytosoc. **14**: 557-560.
- PEDROTTI F. and GAFTA D., 1996 – *Ecologia delle foreste ripariali e paludose dell'Italia*. L'uomo e l'Ambiente **23**: 1-165.
- PETRICCIONE B. and PANI F., 1992 – *Primo contributo alla conoscenza sintassonomica dei boschi igrofili nel Lazio*. Ann. Bot. (Roma), St. Terr. **48** (2): 125-154.
- PICCOLI F. and GERDOL R., 1980 – *Typology and dynamics of a wood in the Po Plaine (N-Italy): The "Bosco della Mesola"*. Coll. Phytosoc. **9**: 161-170.
- PICCOLI F., GERDOL R. and FERRARI C., 1984 – *Carta della vegetazione del bosco della Mesola (Ferrara)*. Atti Ist. Bot. Lab. Critt. s.7, **2**: 3-23.
- POLDINI L., 1989 – *La vegetazione del Carso Isontino e Triestino*. Trieste, 1-313.
- RAMEAU J. C. and SCHMITT A., 1984 – *Les forêts alluvionales de la plaine de la Saône*. Coll. Phytosoc. **9**: 93-113.
- SARTORI F., 1984 – *Les forêts alluvionales de la basse vallée du Tessin (Italie du Nord)*. Coll. Phytosoc. **9**: 201-216.
- SIMON T., 1957, – *Die Wälder des Nördlichen Alföld*. Budapest, 1-172.
- SIMON T., 1960 – *Contributions à la connaissance de la végétation du Delta du Danube*. Ann. Univ. Sci. Budapest, Sect. Biol. **3**: 307-333.
- SOÓ R., 1955 – *La végétation de Bátorliget*. Acta Bot. Acad. Sci. Hung. **1**: 301-334.
- SOÓ R., 1957 – *Phlangengesellschaften aus Bulgarien. 1*. Ann. Univ. Sci. Budapest, Sect. Biol. **1**: 231-239.
- STANISCI A., PRESTI G. and BLASI C., 1998 – *I boschi igrofili del Parco Nazionale del Circeo*. Ecol. Medit. **24**: 73-88.
- TCHOU Y. T., 1948 – *Etudes écologiques et phytosociologiques sur les forêts riveraines du Bas-Languedoc*. Vegetatio **1**(1): 1-28; (2-3): 93-128; (4-5): 217-257; (6): 347-383.
- TUTIN T.G. et al. (eds.), 1964-1993 – *Flora europaea 1-5, 1(ed. 2)*. Cambridge.





