

# FLORISTIC NOTES ON A PECULIAR *ACER OPALUS* MILL. SSP. *OBTUSATUM* (WALDST. ET KIT. EX WILLD.) COMMUNITY ON GARGANO (APULIA, ITALY)

ENRICO VITO PERRINO, VIVIANA CAVALLARO & LUCA CHIANDETTI

University of Bari, Botanical Garden Museum, E. Orabona street 4, 70126 Bari, Italy (enricoperrino@yahoo.it)

Perrino, E. V., Cavallaro, V. & Chiandetti, L.: Floristic notes on a peculiar *Acer opalus* Mill. ssp. *obtusatum* (Waldst. et Kit. ex Willd.) community on Gargano (Apulia, Italy). *Nat. Croat.*, Vol. 21, No. 2., 381–390, 2012, Zagreb.

The results of floristic investigation into the most representative plant community of *Acer opalus* subsp. *obtusatum* growing on Gargano Promontory (Apulia, Italy) are presented. The taxon is in the Regional Red List of plants of Apulia, with lower risk (LR). In all, 126 taxa were recorded, *exsiccata* of which were stored in the *Herbarium Horti Botanici Barensis* (BI), while 15 of them are considered important from a conservation point of view. For these species a detailed account is provided.

**Key words:** floristic investigations, *Acer opalus* subsp. *obtusatum*, Gargano Promontory, Apulia Region

Perrino, E. V., Cavallaro, V. & Chiandetti, L.: Floristička opažanja o posebnoj zajednici *Acer opalus* Mill. ssp. *obtusatum* (Waldst. et Kit. ex Willd.) na području Gargana (Apulija, Italija). *Nat. Croat.*, Vol. 21, No. 2., 381–390, 2012, Zagreb.

U radu se prezentiraju rezultati florističkih istraživanja najzastupljenije biljne zajednice koju na na poluotoku Gargano (Apulija, Italija) čini *Acer opalus* subsp. *obtusatum*. Svojt se nalazi na regionalnom Crvenoj popisu biljaka Apulije kao nisko rizična vrsta (LR). Zabilježeno je ukupno 126 svojti, *exsiccata* su pohranjeni u *Herbarium Horti Botanici Barensis* (BI), a od toga ih se 15 svojti smatra važnim s gledišta zaštite i za njih se daju detaljni podaci.

**Ključne riječi:** floristička istraživanja, *Acer opalus* subsp. *obtusatum*, poluotok Gargano, Apulija

## INTRODUCTION AND OBJECTIVES

From the 16th century the Gargano promontory was the destination of BRASAVOLA (1545), MARANTA (1559), ANGUILLARA (1561), GESNER (1561), ALBERTI (1567), MATTIOLI (1568) and other modern botanists. However, only in the 19th century with TENORE (1811–38) and BASELICE (1812–13) was the discovery of new plants supported by classification work. At the end of World War II, German botanists especially, who were very curious about the rich plant biodiversity of the Gargano territory, provided important contributions to the identification of several taxa (ENGEL, 1964–1966; MERXMÜLLER, 1964). All the previous studies were reorganized and extended to other plant species by FENAROLI, author of the most important floristic work about this particular area of Apulia: *Florae Garganae Prodromus* (1966; 1970; 1973; 1974). Thereafter, the list of species was further enriched by other works (CURTI *et al.*, 1974; PEDROTTI CORTINI & TROIANO, 1984; MORALDO, 1986; PANTALEO, 1991; MEDAGLI *et al.*, 1995; DEL FUOCO, 2003; MORALDO & RICCERI, 2003; LICHT, 2008; PERRINO & WAGENSOMMER, 2012). Thus, today the flora of Gargano is considered to be one of the best-studied on the Italian peninsula (ALBANO *et al.*, 2005).

Nevertheless, these and other contributions lack detailed studies of the coenosis of *Acer opalus* Mill. ssp. *obtusatum* (Waldst. & Kit. ex Willd.) Gams, which is a frequent species in the district of Vico del Gargano (Foggia province). The conservation interest of the taxon comes from the fact that, like other species of *Acer* L., it is hardly ever found in pure plant communities, at least in Italy, and this was the element that led the authors of this work to launch a specific study with the main aim of characterizing the flora of this coenosis. More explicitly, the aim of the present work was to increase the knowledge of the flora of the plant community in question, bearing in mind that it may provide new floristic and/or environmental elements useful for improving the conservation of the ecosystem and hence of the taxon itself.

## STUDY AREA

The main investigated areas are known by the names of Gravastella and Monte Iacovizzo (ca. 500 m a.s.), which are part of the administrative area of Vico del Gargano and fall within the Gargano National Park and the Bosco Umbra ZPS (protected special zone) (code: IT 9110018) (Fig. 1). These wood coenoses are located in the contact zone between formations of *Quercus cerris* L. and those of *Fagus sylvatica* L.

From a geological perspective, the examined areas mainly consist of sedimentary limestone and dolomite rocks deposited between the upper Jurassic and Cretaceous period. The hydrographic network does not show permanent streams and there is no presence of surface water on the central plateau due to an intensive karst.

The RIVAS-MARTÍNEZ (2004) bioclimate classification locates the area into the temperate macrobioclimate, sub-Mediterranean variant (conditions:  $Ios_2 > 2$  and  $Psi < 2.8Tsi$  in summer months). However, according to BIONDI *et al.* (2008) the bioclimate is oceanic, the thermotype is mesotemperate and the ombrotype is subhumid.

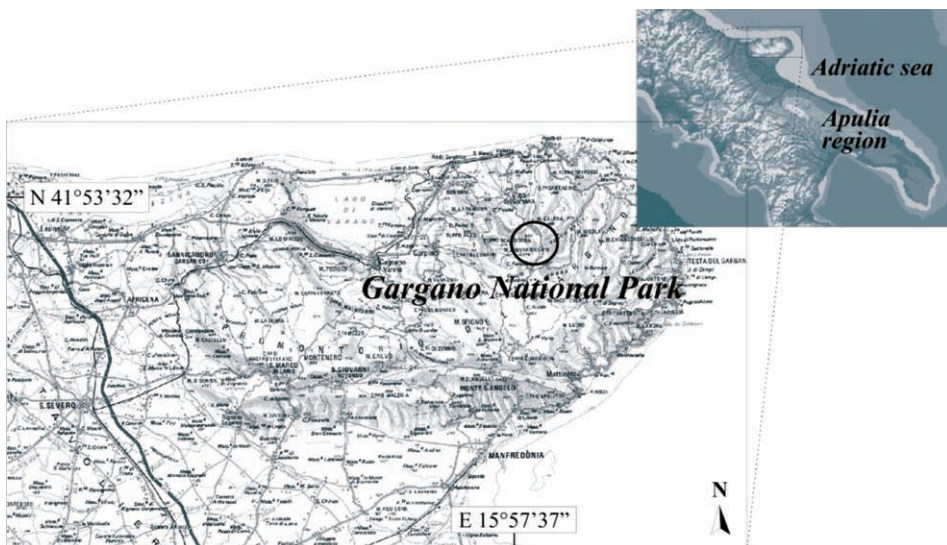


Fig. 1. Studied area.

## METHODS

The floristic list was made through sampling plants every ten days, during the period 2005–2006. The *exsiccata* of the taxon are deposited in the *Herbarium Horti Botanici Barensis* (BI) (Fig. 2). Plant material was determined according to PIGNATTI (1982) and TUTIN *et al.* (1968-76). Taxa nomenclature follows CONTI *et al.*, (2005) and subsequent integrations (CONTI *et al.* 2007), except *Koeleria subcaudata* (Asch. et Graebn.) Ujhelyi, which refers to BRULLO *et al.* (2009). The systematics of the families and their arrangement follows SMITH *et al.* (2006) for the vascular cryptogams megaphylls, and HASTON *et al.* (2007; 2009) for the angiosperms, while for the boundaries it takes into consideration the criteria proposed by the Angiosperm Phylogeny Group (STEVENS, 2008; APG III, 2009). The biological forms and the chorology refer to PIGNATTI (1982). Taxa are listed in alphabetical order and grouped in families according to PIGNATTI (1982). For species of conservation interest acronyms are given as follows: N (a new station for Gargano); VU (vulnerable); LR (lower risk); I (endemic); Is (subendemic); A (amphi-Adriatic), as suggested by several authors (PIGNATTI, 1982; CONTI *et al.*, 1997; CONTI *et al.*, 2005) and CI (Convention on International Trade in Endangered Species) (CITES, 1973). The acronyms related to the biological forms, growth and chorotypes are reported in the *Appendix*.

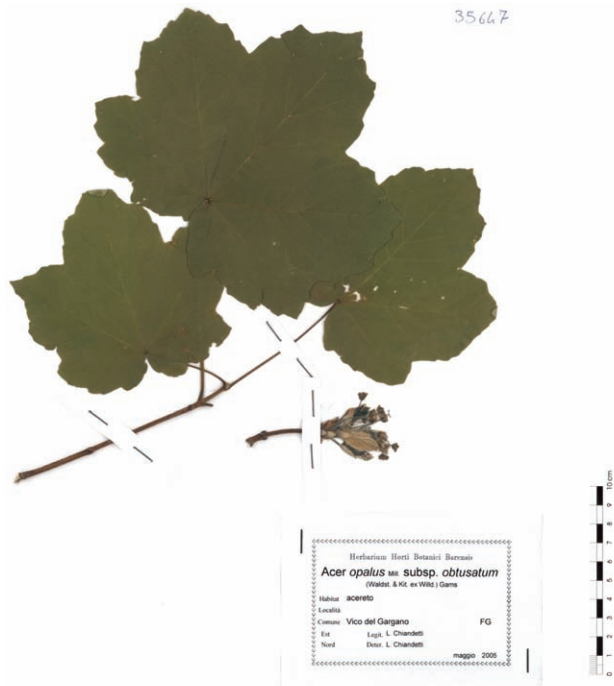


Fig. 2. Herbarium specimen 35647 of *Acer opalus* Mill. subsp. *obtusatum* (*Herbarium Horti Botanici Barensis*).

## RESULTS AND DISCUSSION

From the nomenclatural point of view, PIGNATTI (1982) referring to the Italian group of opalus maple, distinguished three species: *Acer opulifolium* Chaix, *A. obtusatum* W. et K. and *A. neapolitanum* Ten. Recently, CONTI *et al.* (2005), following the previous proposals of VAN GELDEREN *et al.* (1994), placed the three species into a single species: *A. opalus* Mill. In particular, *A. obtusatum* and *A. neapolitanum* both referred to *A. opalus* Mill. subsp. *obtusatum* (Waldst. & Kit ex Willd.) Gams.

*A. opalus* subsp. *obtusatum* is a subendemic species of southern Italy, included in the Regional Red List with the status of lower risk (LR). It has central-eastern Mediterranean distribution, being present in Algeria, Corsica, Italy, ex-Yugoslavia, Greece and Albania (GREUTER *et al.*, 1984–1989). In Italy it is found mainly in the central-southern regions (CONTI *et al.*, 2005) to Sicily, doubtfully in the Tosco-Emiliano Apennines, where it prefers the chestnut zone, but it also extends into the beech wood. On Gargano this plant community has been referred to the *Pulmonario apenninae-Aceretum neapolitani* association (BIONDI *et al.*, 2008).

The results show the presence of 126 *taxa*, three of which are reported in the Regional Red List (CONTI *et al.*, 1997), two are endemic, two others are subendemic and eight are rare, especially at regional and/or national level. The most represented family are Fabaceae (17.5%), followed by Poaceae (11.9%), Rosaceae (9.5%) and Asteraceae (7.1%), while the rest of the families occur with values lower than 6% (Fig. 3).

The chorological spectrum (Fig. 4) shows that although the Mediterranean part is well represented (37.5%), the species are notably fewer than those belonging to the Apulia flora (52.0%) (MARCHIORI *et al.*, 2000).

The presence of a discrete number of palaeotemperate (5.6%), European (4.0%) and Mediterranean-mountain species (4.8%) is entirely coherent with the bioclimatic characteristics of the area that has a sub-Mediterranean variant (PERRINO, 2006) of the temperate macrobioclimate (DICECCA, 2003), according to the classification proposed by RIVAS-MARTÍNEZ (2004). Some data concerning the distribution of species of conservation interest are reported here.

*Carex depauperata* Good. is a Mediterranean-sub-Atlantic species that is present in Italy in the central-southern regions within deciduous thermophilic woods where it is very rare (PIGNATTI, 1982). It is listed in the Regional Red List (CONTI *et al.*, 1997) with the status of vulnerable (VU) and there are no detailed studies about its distribution in Apulia, which confirms its only limited occurrence in the Region. All of the Gargano stations, referring to Monte Spigno, San Giovanni Rotondo and various locations of the Foresta Umbra, are quite old and are mentioned in the work of FENAROLI (1974). In any case no clear reference to the coenosis of *A. opalus* Mill. ssp. *obtusatum* was ever made.

*Paeonia mascula* L. Mill. ssp. *mascula* is a European-Caucasic species of notable interest as reported in the Regional Red List (CONTI *et al.*, 1997) with the vulnerable status (VU). Recent studies confirm its presence only in Greece and Italy (MUSACCHIO *et al.*, 2000; CESCA *et al.*, 2001; PASSALACQUA & BERNARDO, 2004), while it is uncertain in Southern Europe and Anatolia (GREUTER *et al.*, 1989; TUTIN *et al.*, 1968–76). In Italy the species is reported only in Apulia, Basilicata and Lazio. In Apulia it is reported for Gargano (FENAROLI, 1966; BISCOTTI, 2002), the northwest and southeast of Murge (Centre of Apulia) (BIANCO, 1976) and populations are in general represented by few individuals. In the investigated area, grazing and fire have caused a partial degradation of the wood and in fact they are major threats to the species.

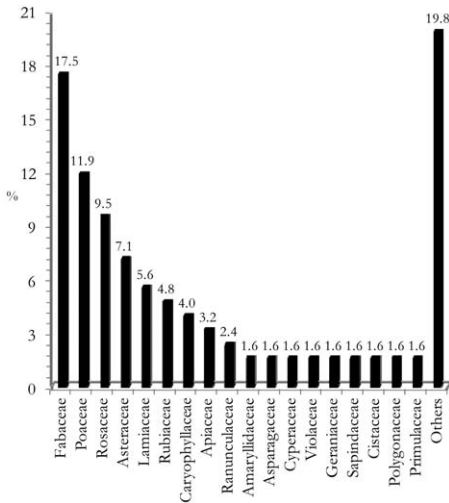


Fig. 3. Species by family.

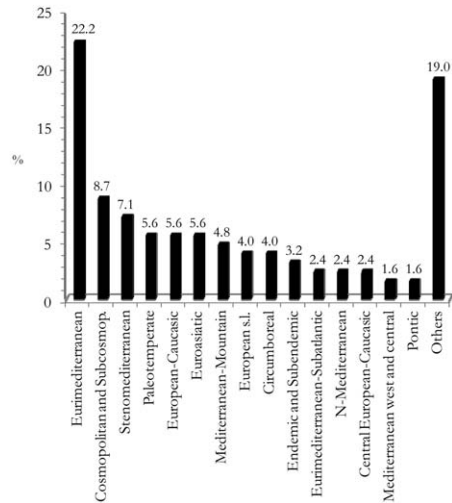


Fig. 4. Chorological spectrum.

*Crocus vernus* (L.) Hill. subsp. *vernus* was reported for the first time in Apulia by WAGENSOMMER & DI PIETRO (2006) on a pasture, during sampling on 26 March 2005 near San Marco in Lamis. The station of Gravastella, at 600 m a.s., (Vico del Gargano) represents the second station for Apulia; the sample was collected on 11 March 2005 and is preserved in the *Herbarium Horti Botanici Barensis* (BI). Field observations have shown that an extended area around Gravastella has a population of healthy individuals and is of considerable importance, since this species seems to reach its ecological optimum in a wooded area rather than on a grassland, as observed in the first citation for Apulia.

*Cytisus spinescens* (Presl.) Rothm. is an amphi-Adriatic species present in central-southern Italy and in Dalmatia. It is the characteristic species of the *Cytiso-Bromion erecti* Bonin 1978, alliance of montane dry grasslands and micro-chamaephitic garrigues of the central and southern Apennines (DI PIETRO, 2011), except for north-eastern Lucania, where it characterizes the *Chamaecytiso spinescens-Stipetum austroitalicae* Forte, Terzi & Perrino 2005, association of *Hippocrepido glaucae-Stipion austroitalicae* Forte, Terzi, Perrino 2005, independent alliance of southeast Italy (FORTE *et al.*, 2005). In Apulia it is relatively common on Gargano (FANELLI *et al.*, 2001; PERRINO, 2006), which identifies the priority habitat »Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (\*important orchid sites)« (6210\*) (BIONDI & BLASI, 2009), while it is rare in other areas of the region. Other representative populations are localized to bush or scrub vegetation of Bosco Difesa Grande (Centre of Apulia) and Parco delle Gravine (south and center of Apulia).

*Echinops ritro* L. subsp. *siculus* (Strobl) Greuter and *Lathyrus jordanii* Ten., which characterize the *Ptilostemo-Quercenion cerridis* Bonin 1976 suballiance of oak and mixed woods, are here mentioned because they are endemic to the whole of central-southern Italy, and are only rarely reported in flora works.

*E. ritro* subsp. *siculus* has been indicated in Apulia with certainty for Gargano, where it is usually found within formations of *Quercus cerris* L. (FIORI, 1923-1933; FENAROLI, 1974; PERRINO, 2006; BIONDI *et al.*, 2008) and for the province of Taranto

(FIORI, 1923-1933). As for the province of Bari, BIANCO (1962) cites the species but not the subsp. *siculus*.

*L. jordanii* Ten. is reported in Apulia only for Gargano (FORTE, 1995). The findings at Gravastella and Monte Iacovizzo represent two new Apulia stations. It is probable that the minute morphological differences related to the root, which makes it easy to confuse with *L. niger* (L.) Bernh., underestimate its real frequency, at least on Gargano.

*Veronica officinalis* L. is common only in the Alps and it is rare in the rest of Italy. *Allium pendulinum* Ten., *Asperula laevigata* L., *Cardamine graeca* L., *Chaerophyllum temulum* L., *Dianthus armeria* L. subsp. *armeria*, *Ilex aquifolium* L. and *Vicia cassubica* L. are also rare species for many areas of Italy.

## FLORISTIC LIST

### CHAROPHYTA

#### EQUISETOPSIDA

#### POLYPODIIDAE

#### DENNSTAEDTIACEAE

*Pteridium aquilinum* (L.) Kuhn subsp. *aquilinum* – G  
– Rz – C

#### MAGNOLIIDAE

#### SMILACACEAE

*Smilax aspera* L. – NP – Tps

#### ORCHIDACEAE

*Anacamptis pyramidalis* (L.) Rich. – G – Bl – Me – CI

#### IRIDACEAE

*Crocus vernus* (L.) Hill subsp. *vernus* – G – Bl – Ecs

#### ASPHODELACEAE

*Asphodelus ramosus* L. subsp. *ramosus* – G – Rz – Ms

#### AMARYLLIDACEAE

*Allium pendulinum* Ten. – G – Bl – Msw

*Allium subhirsutum* L. – G – Bl – Ms

*Galanthus nivalis* L. – G – Bl – Eca – CI

#### ASPARAGACEAE

*Loncomelos pyrenaicus* (L.) Hrouda ex J. Holub. – G  
– Bl – Me

*Muscari comosum* (L.) Mill. – G – Bl – Me

#### RUSCACEAE

*Ruscus aculeatus* L. – Ch – Fr – Me.

#### JUNCACEAE

*Luzula forsteri* (Sm.) DC. – H – Cs – Me

#### CYPERACEAE

*Carex depauperata* Curtis ex With – H – Cs – Masb

*Carex flacca* Schreber subsp. *serrulata* (Biv.) Greuter –  
G – Rz – E

#### POACEAE

*Antoxanthum odoratum* L. – H – Cs – Ea

*Brachypodium sylvaticum* (Huds.) P. Beauv. – H – Tmp

*Briza maxima* L. – T – Sc – Tps

*Bromus madritensis* L. – T – Sc – Me

*Bromus racemosus* L. – T – Sc – Eca

*Cynosurus cristatus* L. – H – Cs – Eca

*Cynosurus echinatus* L. – T – Sc – Me

*Cynosurus effusus* L. – T – Sc – Ms

*Dactylis glomerata* L. – T – Cs – Tmp

*Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman  
– H – Cs – Ms

*Elymus repens* (L.) Gould. subsp. *repens* – G -Rz – Cb

*Festuca exaltata* C. Presl. – G – Rz – Mm

*Koeleria subcaudata* (Asch. et Graebn.) Ujhelyi – H –  
Cs -Mm

*Melica transsilvanica* Schur subsp. *transsilvanica* – H  
– Cs -Eesp

*Phleum pratense* L. – H – Cs – Cb

#### RANUNCULACEAE

*Anemone apennina* L. subsp. *apennina* – G – Rz – Ese

*Ranunculus ficaria* L. – G/H – Ea

*Ranunculus neapolitanus* Ten. – H – Sc – Mmne

#### PAEONIACEAE

*Paeonia mascula* (L.) Mill. subsp. *mascula* – G – Rz –  
Eca – VU

#### FABACEAE

*Anthyllis vulneraria* L. subsp. *rubriflora* (DC.) Arcang.  
– H – Sc – Me

*Cytisus spinescens* C. Presl. – Ch – Sf – Is

*Cytisus villosus* Pourret – P – Cs – Mecw

*Genista tinctoria* L. – Ch – Sf – Ea

*Lathyrus aphaca* L. subsp. *aphaca* – T – Sc – Me

*Lathyrus jordanii* Ten. – G – Rz – I

*Lathyrus sphaericus* Retz. – T – Sc – Me

*Lathyrus sylvestris* L. subsp. *sylvestris* – H – Sd – E

*Lathyrus venetus* (Mill.) Wohlf. – G – Rz – P

*Lens ervoides* (Brign.) Grande – T – Sc – Msp

*Lotus corniculatus* L. – H – Sc – C

*Ornithopus compressus* L. – T – Sc – Me

*Scorpiurus muricatus* L. – T – Sc – Me

*Securigera securidaca* (L.) Deg. & Dorfl. – T – Sc – Me

*Spartium junceum* L. – P – Cs – Me

*Trifolium campestre* Schreb. – T – Sc – Tmpw

*Trifolium pratense* L. – H – Sc – Cs

- Trifolium pratense* L. subsp. *semipurpureum* (Strobl.) Pign. – H – Sc – Cs  
*Trifolium repens* L. – H – Rp – Cs  
*Vicia cassubica* L. – H – Sc – EcCa  
*Vicia melanops* Sm. – T – Sc – Es  
*Vicia sativa* L. – T – Sc – Cs
- ROSACEAE**  
*Aremonia agrimonoides* (L.) DC subsp. *agrimonoides* – H – Rs – Omne  
*Crataegus monogyna* Jacq. – P – Cs – Tmp  
*Fragaria vesca* L. subsp. *vesca* – H – Rp – C  
*Geum urbanum* L. – H – Sc – Cb  
*Malus sylvestris* (L.) Miller – P – Sc – EcCa  
*Potentilla detommasii* Ten. – H – Sc – Ese  
*Pyrus spinosa* Forssk. – P – Cs – Ms  
*Rosa canina* L. – NP – Tmp  
*Rubus ulmifolius* Schott – NP – Me  
*Sanguisorba minor* Scop. subsp. *balearica* (Bourg. ex Nyman) Munoz Garm. et C. Navarro – H – Sc – Cs  
*Sorbus domestica* L. – P – Sc – Me  
*Sorbus torminalis* (L.) Crantz – P – Cs – Tmp
- FAGACEAE**  
*Fagus sylvatica* L. subsp. *sylvatica* – P – Sc – Ec
- BETULACEAE**  
*Ostrya carpinifolia* Scop. – P – Cs/Sc – P
- EUPHORBIACEAE**  
*Euphorbia amygdaloides* L. subsp. *amygdaloides* – Ch – Sf – EcCa
- VIOLACEAE**  
*Viola alba* subsp. *dehnhardtii* (Ten.) W. Becker – H – Rs – Me  
*Viola reichenbachiana* Jordan ex Boreau – H – Sc – Esb
- HYPERICACEAE**  
*Hypericum perforatum* L. – H – Sc – Tmp
- GERANIACEAE**  
*Geranium purpureum* Vill. – T – Sc – Me  
*Geranium pyrenaicum* Burm. f. subsp. *pyrenaicum* – H – Sc – Me
- ANACARDIACEAE**  
*Pistacia lentiscus* L. – P – Cs – Mss
- SAPINDACEAE**  
*Acer campestre* L. – P – Sc – EcCa  
*Acer opalus* Mill. subsp. *obtusatum* (Waldst. et Kit. ex Willd.) Gams – P – Sc – Is – LR
- MALVACEAE**  
*Tilia platyphyllos* Scop. subsp. *platyphyllos* – P – Sc – EcCa
- THYMELAEACEAE**  
*Daphne laureola* L. – P – Cs – Meas
- CISTACEAE**  
*Cistus creticus* L. – NP – Mec  
*Cistus monspeliensis* L. – NP – Ms
- BRASSICACEAE**  
*Cardamine graeca* L. – T – Sc – Mn
- POLYGONACEAE**  
*Rumex acetosella* L. – H – Sc – Cs  
*Rumex sanguineus* L. – H – Sc – EcCa
- CARYOPHYLLACEAE**  
*Dianthus armeria* L. subsp. *armeria* – H – Sc – EcCa  
*Petrorhagia saxifraga* (L.) Link subsp. *gasparrinii* (Guss.) Greuter & Burdet – H – Cs – Me  
*Silene italica* (L.) Pers. – H – Rs – Me  
*Silene nocturna* L. – T – Sc – Mmms  
*Stellaria media* (L.) Vill. subsp. *media* – T – Rp – C
- ERICACEAE**  
*Erica arborea* L. – P – Cs – Msw
- PRIMULACEAE**  
*Cyclamen hederifolium* Aiton – G – Bl – Msn – CI  
*Cyclamen repandum* Sm. subsp. *repandum* – G – Bl – Mn – CI
- RUBIACEAE**  
*Asperula laevigata* L. – H – Sc – Mecw  
*Cruciata laevipes* Opiz – H – Sc – Ea  
*Galium lucidum* All. – H – Sc – Me  
*Galium odoratum* (L.) Scop. – G – Rz – Ea  
*Rubia peregrina* L. – P – Ln – Msm  
*Sherardia arvensis* L. – T – Sc – Cs
- GENTIANACEAE**  
*Centaurium erythraea* Rafn. subsp. *erythraea* – H – Bn – Tmp
- BORAGINACEAE**  
*Buglossoides purpureocaerulea* (L.) I.M. Johnst. – H – Sc – Esp
- CONVOLVULACEAE**  
*Convolvulus cantabrica* L. – H – Sc – Me
- PLANTAGINACEAE**  
*Veronica officinalis* L. – H – Rp – Mmne
- LAMIACEAE**  
*Calamintha nepeta* (L.) Savi – H – Sc – Oes  
*Clinopodium vulgare* L. – H – Sc – Cb  
*Origanum vulgare* L. subsp. *viridulum* (Martin-Donos) Nyman – H – Sc – Msde  
*Prunella laciniata* L. – H – Sc – Me  
*Prunella vulgaris* L. subsp. *vulgaris* – H – Sc – Cb  
*Scutellaria columnae* All. subsp. *columnae* – H – Sc – Mmne  
*Teucrium chamaedrys* L. – Ch – Sf – Me
- OROBANCHACEAE**  
*Orobanche hederæ* Duby – T – Pr – Me
- AQUIFOLIACEAE**  
*Ilex aquifolium* L. – P – Cs – Meas
- ASTERACEAE**  
*Bellis annua* L. subsp. *annua* – T – Sc – Msm  
*Bellis perennis* L. – H – Rs – Cb  
*Crepis leontodontoides* All. – H – Rs – Mmw

<i>Doronicum orientale</i> Hoffm. – G – Rz – Oesec	ARALIACEAE
<i>Echinops ritro</i> L. subsp. <i>siculus</i> (Strobl) Greuter – H	<i>Hedera helix</i> L. – P – Ln – Meas
– Sc – I	
<i>Hieracium murorum</i> Auct. – H – Sc – Esb	APIACEAE
<i>Klasea flavescens</i> (L.) Holub – H – Sc – Msdw	<i>Anthriscus nemorosa</i> (M. Bieb.) Sprengel – H – Sc – Esp
<i>Pulicaria odora</i> (L.) Rchb. – H – Sc – Me	<i>Chaerophyllum temulum</i> L. – T – Sc – Ea
<i>Urospermum dalechampii</i> (L.) F.W. Schmidt – H – Sc	<i>Oenanthe pimpinelloides</i> L. – H – Sc – Ma
– Me	<i>Physospermum verticillatum</i> (Waldst. et Kit.) Vis. – H
	– Sc – Mm

## CONCLUSIONS

The flora of the investigated areas (Gravastella and Monte Iacovizzo) shows the presence of species of conservation interest. These species, associated with the absence of nitrophilic-ruderal and exotic species, indicate a good state of natural resources. Even if Mediterranean species dominate, the penetration of a large number of palaeotemperate and European species is evident and has been observed, which is in agreement with the temperate character of the area. A comparison with the flora of other coenoses of *Acer opalus* subsp. *obtusatum* in the Appennines of southern Italy would be very useful.

## ACKNOWLEDGEMENT

We would like to thank the Herbarium of the Botanic Garden Museum of the University of Bari »Aldo Moro« for having allowed use of images from the herbarium and the referees for valuable comments and suggestions on the manuscript.

Received March 1, 2011

## REFERENCES

- ALBANO, A., ACCOGLI, R., MARCHIORI, S., MEDAGLI, P. & MELE, C., 2005: Stato delle conoscenze floristiche in Puglia. In: SCOPPOLA, A. & BLASI, C., Stato delle Conoscenze sulla Flora Vascolare d'Italia, 185–189. Palombi Editore, Roma.
- ALBERTI, L., 1572: Descrizione di tutta Italia in Vinegia per Domenico de' Farri, MDL–VII.
- ANGUILLARA, L., 1561: Semplici ecc., Venetia. In BÉGUINOT A. 1909, Ricordi di una escursione botanica nel versante orientale del Gargano. Nuov. Giorn. Bot. Ital., n.s., **16**, 97–123.
- APG III, 2009: An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. Apg III. Bot. J. Linn. Soc., **161**, 105–121.
- BASELICE, G., 1812: Rapporto fatto al Signor D. Michele Tenore Direttore del Real Giardino delle Pianta, da Gaetano Baseliçe corrispondente al detto Real Giardino ecc., sulla peregrinazione botanica, eseguita da lui in una parte del monte Gargano. Viaggio botanico eseguito nei circondari di Manfredonia, Monte S. Angelo, e S. Marco in Lamis. Resto della flora dei suddetti circondari con qualche osservazione fatta su di essa. Saggio sugli insetti rinvenuti in questa parte del Gargano. Giorn. Encicl. di Napoli, anno VI di assoc., vol. **1**, 16–70.
- BIANCO, P., 1962: Flora e vegetazione delle Murge di Nord–Ovest. Ann. Fac. Agr. Univ. Bari, **16**, 459–640.
- BIANCO, P., 1976: Attuale distribuzione geografica ed habitat pugliese della *Paeonia mascula* (L.) Miller. Ann. Fac. Agr. Univ. Bari, **28**, 211–218.
- BIONDI, E. & BLASI, C., (Eds.), 2009: Manuale Italiano di interpretazione degli habitat della direttiva 92/43 EEC, <http://vnr.unipg.it/habitat/index.jsp>.
- BIONDI, E., CASAVECCHIA, S. & BISCOTTI, N., 2008: Forest biodiversity of the Gargano Peninsula and a critical revision of the syntaxonomy of the mesophilous woods of southern Italy. Fitosociologia **45** (2), 93–127.
- BISCOTTI, N., 2002: Botanica del Gargano. Voll. 2. Gerni Editori, San Severo.



- BRASAVOLA, A.M., 1545: Examen omnium simplicium medi-camentorum ecc. Venetiis – In BÉGUINOT A., 1909 – Ricordi di una escursione botanica nel versante orientale del Gargano. Nuov. Giorn. Bot. Ital., n.s., **16**, 97–123.
- BRULLO, S., GIUSSO DEL GALDO G. & MINISSALE P., 2009: Taxonomic revision of the *Koeleria splendens* C. Presl. group (*Poaceae*) in Italy based on morphological characters. Plant Biosystems, **143** (1), 140–161.
- CESCA, G., BERNARDO, L. & PASSALACQUA, N.G., 2001: *Paeonia morisii* sp. nov. (*Paeoniaceae*), a new species from Sardinia. Webbia, **56** (2), 229–240.
- CITES (Convention on International trade in endangered species of wild fauna and flora): 1973, <http://www.cites.org/>.
- CONTI, F., ABBATE, G., ALESSANDRINI, G. & BLASI, C., 2005: An Annotated Checklist of the Italian Vascular Flora. Palombi Editori, Roma.
- CONTI, F., ALESSANDRINI, G., BACCHETTA, G., BANFI, E., BARBERIS, G., BARTOLUCCI, F., BERNARDO, L., BOUVET, D., BOVIO, M., DEL GUACCHIO, E., FRATTINI S., GALASSO, G., GALLO, L., GANGALE, C., GOTTSCHLICH, G., GRÜNANGER, P., GUBELLINI, L., IIRITI, G., LUCARINI, D., MARCHETTI, D., MORALDO, B., PERUZZI, L., POLDINI, L., PROSSER, F., RAFFAELLI, M., SANTANGELO, A., SCASSELLATI, E., SCORTEGAGNA, S., SELVI, F., SOLDANO, A., TINTI, D., UBALDI, D., UZUNOV, D. & VIDALI, M., 2007: Updating of the Checklist of the Italian Vascular Flora. Natura Vicentina, Quad. Mus. Naturalistico Archeol., **10**, 5–74.
- CONTI, F., MANZI, A. & PEDROTTI, F., 1997: Liste Rosse Regionali delle Piante d'Italia. World Wildlife Fund (WWF) Italia. Società Botanica Italiana (SBI). Centro Interdipartimentale Audiovisivi e Stampa, Univ. Camerino, pp 139.
- CURTI, L., LORENZONI, G.G. & MARCHIORI, S., 1974: Florula del Bacino del Lago di Lesina (Foggia). Mem. Biogeogr. Adriat., **9**, 45–117.
- DEL FUOCO, C., 2003: Orchidee del Gargano. Edizioni del Parco, Foggia.
- DICECCA, G., 2003: Elementi per lo studio del fitoclima del Promontorio Garganico. Degree thesis in Natural Sciences. Botanical Garden Museum of Bari University (Italy).
- DI PIETRO, R., 2011: New dry grassland associations from the Ausoni-Aurunci mountains (central Italy) – syntaxonomical updating and discussion on the higher rank syntax. Hacquetia, **10** (2), 183–231.
- ENGEL, H., 1964–1966: Plantae phanerogamicae rariores vel notabiles in Monte Gargano. In BISCOTTI, N., 2002: Botanica del Gargano.
- FANELLI, G., LUCCHESI, F. & PAURA, B., 2001: Le praterie a *Stipa austroitalica* di due settori adriatici meridionali (basso Molise e Gargano). Fitosociologia, **38** (2), 25–36.
- FENAROLI, L., 1966: Florae Garganicae Prodromus, Pars prima. Webbia, **21** (2), 839–944.
- FENAROLI, L., 1970: Florae Garganicae Prodromus, Pars altera. Webbia, **24** (2), 435–578.
- FENAROLI, L., 1973: Florae Garganicae Prodromus, Pars tertia. Webbia, **28** (1), 323–410.
- FENAROLI, L., 1974: Florae Garganicae Prodromus, Pars quarta. Webbia, **29** (1), 123–301.
- FIORI, A., 1923–1933: Nuova Flora Analitica d'Italia, vol. 1–3. Bologna.
- FORTE, L., 1995: Autocologia di *Quercus cerris* L. e *Fagus sylvatica* L. e sinecologia delle relative cenosi nel bosco di Ischitella (Fg) sul promontorio del Gargano (Puglia). Ph.D thesis, University of Catania, Italy.
- FORTE, L., PERRINO, E.V. & TERZI, M., 2005: Le praterie a *Stipa austroitalica* Martinovsky ssp. *austroitalica* dell'Alta Murgia (Puglia) e della Murgia Materana (Basilicata). Fitosociologia, **42** (2), 83–103.
- GESNER, C., 1561: Adnotationes in Dioscoridem, Argentorati. In BÉGUINOT, A., 1909: Ricordi di una escursione botanica nel versante orientale del Gargano. Nuov. Giorn. Bot. Ital., n.s., **16**, 97–123.
- GREUTER, W., BURDET, H.M. & LONG, G., 1984: Med-Checklist, vol. 1.
- GREUTER, W., BURDET, H.M. & LONG, G., 1989: Med-Checklist, vol. 4.
- HASTON, E., RICHARDSON, J.E., STEVENS, P.E., CHASE, M.W. & HARRIS, D.J., 2007: A linear sequence of Angiosperm Phylogeny Group II families. Taxon, **56** (1), 7–12.
- HASTON, E., RICHARDSON, J.E., STEVENS, P.E., CHASE, M.W. & HARRIS, D.J., 2009: The Linear Angiosperm Phylogeny Group (LAPG) III: a linear sequence of the families in APG III. Bot. J. Linn. Soc., **161**, 128–131.
- LICHT, W., 2008: Bestimmungsschlüssel zur flora des Gargano (Süd-Italien). Shaker Verlag, Aachen.
- MARANTA, B., 1559: Metodi cognoscendorum simplicium libri tres. Venetiis.
- MARCHIORI, S., MEDAGLI, P., SABATO, S. & RUGGIERO, L., 1993: Remarques chorologiques sur quelques taxa nouveaux ou rares dans le Salento (Pouilles, Italie). Inform. Bot. Ital., **25** (1), 37–45.

- MATTIOLI, P.A., 1568: I discorsi nelli sei libri di P.D.A. della materia medicinal. In Bèguinot, A., 1909: Ricordi di una escursione botanica nel versante orientale del Gargano. Nuov. Giorn. Bot. Ital., n.s., **16**, 97–123.
- MEDAGLI, P., D'EMERICO, S., DEL FUOCO, C., RUGGIERO, L. & BIANCO, P., 1995: Orchidee nuove o riconfermate per la flora del Gargano (Italia). Journ. Eur. Orch., **27** (2), 301–310.
- MERXMÜLLER, H., 1964: Pflanzenliste der Exkursion an den Monte Gargano. Vom **19.IV** and **24.IV**.
- MORALDO, B., 1986: Il genere *Stipa* L. (*Gramineae*) in Italia. Webbia, **40** (2), 203–278.
- MORALDO, B. & RICCI, C., 2003: Alcune novità tassonomico-nomenclaturali sul genere *Stipa* L. (*Poaceae*) in Italia. Webbia, **58** (1), 103–111.
- MUSACCHIO, A., PELLEGRINO, G., BERNARDO, L., PASSALACQUA, N.G. & CESCA, G., 2000: On the taxonomy and distribution of *Paeonia mascula* s.l. in Italy based on rDNA ITS1 sequences. Plant Biosystems, **134** (1), 61–66.
- PANTALEO, F., 1991: La Foce S. Andrea e i canali adiacenti (Lago di Lesina – Puglia): studio floristico. Ann. Bot., **XLIX** (8), 123–135.
- PASSALACQUA, N.G. & BERNARDO, L., 2004: The genus *Paeonia* L. in Italy: taxonomic survey and revision. Webbia, **59** (2), 215–268.
- PEDROTTI CORTINI, C. & TROIANO, R., 1984: Flora briologica della lecceta di Monte Sant'Angelo (Foggia). Giorn. Bot. Ital., **118**, 189–199.
- PERRINO, E.V., 2006: Vegetazione del Gargano (fasce costiera e collinare). Ph.D thesis, Botanical Department of Catania University, Italy.
- PERRINO, E.V. & WAGENSOMMER, R., 2012: Aggiornamenti floristici per il Gargano (Puglia) con riferimento agli habitat della Direttiva 92/43/EEC. Inform. Bot. Ital., **44** (1), 163–170.
- PIGNATTI, S., 1982: Flora d'Italia, vol. 1–3. Edagricole, Bologna.
- RIVAS-MARTÍNEZ, S., 2004: Global Bioclimatics. Clasificación Bioclimática de la Tierra, www.global-bioclimatics.org/book/bioc/bioc1.pdf.
- STEARNS, F.C. & DAVIS, P.H., 1984: Peonies of Greece. The Goulandris Natural History Museum, Kifissia.
- SMITH, A.R., PRYER, K.M., SCHUETTPELZ, E., KORALL, P., SCHNEIDER, H. & WOLF P.G., 2006: A classification for extant ferns. Taxon, **55** (3), 705–731.
- STEVENS, P.F., 2008: Angiosperm Phylogeny Website, Version 9, June 2008 [and more or less continuously update since], www.mobot.org/MOBOT/research/APweb/.
- TENORE, M., 1811–38: Flora Napoli, Vol. **I–IV**.
- TUTIN, T.G., HEYWOOD, V.H., BURGESS, N.A., MOORE, D.M., VALENTINE, D.H., WALTERS, S.M. & WEBB, D.A., (Eds.), 1968–76: Flora Europea, **1–5** (1st edition). University Press, Cambridge.
- VAN GELDEREN, D.M., DE JONG, P.C. & OTERDOOM, H.J., 1994: Maples of the World. Timber Press, Portland.
- WAGENSOMMER, R. P. & DI PIETRO, R., 2006: Notulae alla checklist della flora vascolare italiana 1244. Inform. Bot. Ital., **38** (1), 205.

## APPENDIX

### Acronyms of the biological forms, growth forms and chorologic types

**Biological Forms.** Ch – chamaephytes; P – phanerophytes; G – geophytes; H – hemicryptophytes; NP – nanophanerophytes; T – therophytes.

**Growth Forms.** Bl – bulbose; Bn – biennial; Cs – caespitose; Fr – fruticose; Ln – lianose; Pr – parasite; Rp – reptant; Rs – rosulate; Rz – rhizomatose; Sc – scapose; Sd – scandent; Sf – suffruticose.

**Chorologic types.** C – Cosmopolitan; Cb – Circumboreal; Cs – Subcosmopolitan; E – European; Ea – Euroasiatic; Ec – central-European, EcCa – central-European Caucasian; Eca – European-Caucasic; Ecs – central-European southern; Es – south-European, Esb – Eurosiberian; Ese – European south-eastern; Eesp – south-European – south-Siberian Pontic; Esp – south-European Pontic; Ma – Medit.-Atlantic; Masb – Medit.-sub-Atlantic; Me – Eurimedit.; Meas – Eurimedit.-Subatlantic; Mec – central-Medit.; Mecw – central-Medit. western; Mm – Medit.- Mountain; Mmms – Medit.-Macaronesian northern; Mmne – Medit.-Mountain north-eastern; Mmw – Medit.-Mountain western; Mn – Medit. northern; Ms – Stenomedit.; Msde – Medit. south-eastern; Msdw – Medit. south-western; Msm – Stenomedit.-Macaronesian; Msn – Stenomedit. northern; Msp – Stenomedit. Pontic; Mss – Stenomedit. southern; Msw – Stenomedit. western; Oes – Orophil south-European; Oesec – Orophil European-Caucasic south-eastern; Omne – Orophil-Medit. north-eastern; P – Pontic; Tmp – Palaeotemperate; Tmpw – Palaeotemperate western; Tps – Subtropical.