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

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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

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: Flore Garganicae 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 & RICCIERI, 2003; LICHT, 2008; PERRINO & WAGENSMOMMER, 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: Ios2>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.](image-url)
METHODS

The floristic list was made through sampling plants every ten days, during the period 2005–2006. The exsiccat\textit{a} of the taxon are deposited in the \textit{Herbarium Horti Botanici Barensis} (BI) (Fig. 2). Plant material was determined according to \textit{Pignatti} (1982) and \textit{Tutin et al.} (1968-76). Taxa nomenclature follows \textit{Conti et al.}, (2005) and subsequent integrations (\textit{Conti et al.} 2007), except \textit{Koeleria subcaudata} (Asch. et Graebn.) Ujhelyi, which refers to \textit{Brullo et al.} (2009). The systematics of the families and their arrangement follows \textit{Smith et al.} (2006) for the vascular cryptogams megaphylls, and \textit{Haston et al.} (2007; 2009) for the angiosperms, while for the boundaries it takes into consideration the criteria proposed by the Angiosperm Phylogeny Group (\textit{Stevens}, 2008; \textit{APG III}, 2009). The biological forms and the chorology refer to \textit{Pignatti} (1982). Taxa are listed in alphabetical order and grouped in families according to \textit{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 (\textit{Pignatti}, 1982; \textit{Conti et al.}, 1997; \textit{Conti et al.}, 2005) and CI (Convention on International Trade in Endangered Species) (\textit{CITES}, 1973). The acronyms related to the biological forms, growth and chorotypes are reported in the \textit{Appendix}.

\textbf{Fig. 2.} Herbarium specimen 35647 of \textit{Acer opalus} Mill. subsp. \textit{obtusatum} (\textit{Herbarium Horti Botanici Barensis}).
RESULTS AND DISCUSSION

From the nomenclatural point of view, PIGNATI (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 (GREATER 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-Emilian 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 Asteraeae (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 (PIGNATI, 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.

*Paonia mascula* L. Mill. ssp. *mascula* is a European-Caucasian 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 (MUSACCIO et al., 2000; CESCA et al., 2001; PASSALACQUA & BERNARDO, 2004), while it is uncertain in Southern Europe and Anatolia (GREATER 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.
Crocus vernus (L.) Hill. subsp. vernus was reported for the first time in Apulia by Wagensomer & 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-chamaephytic garrigue of the central and southern Apennines (Di Pietro, 2011), except for north-eastern Lucania, where it characterizes the Chamaecytiso spinescentis-Stipetum austroitalicae Forte, Terzi & Perrino 2005, association of Hippocrepido glaucae-Stipion austroitalicae Forte, Terzi, Perrino 2005, independent alliance of southeast Italy (Forti 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*) (Biondo & Basi, 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-Quercion 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; Biondo 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 (Forti, 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

ASPHEDELACEAE

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

AMARYLLIDACEAE

Allium pendulinum Ten. – G – Bl – Ms

Allium subhirsutum L. – G – Bl – Ms

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

ASPARAGACEAE

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

Ruscus aculeatus L. – Ch – Fr – Me.

JUNCACEAE

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

CYPERACEAE

Carex depauperata Curtis ex With – H – Cs – Masp

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

POACEAE

Antoxanthum odoratum L. – H – Cs – Ea

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

Bromus 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

Elhymus repens (L.) Gould. subsp. repens – G – Rz – Cb

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

Koeleria sulcata (Asch. et Graebn.) Ujhelyi – H – Cs – Mm

Melica transsilvanica Schur subsp. transsilvanica – H – Cs – Esesp

Phleum pratense L. – H – Cs – Cb

RANUNCULACEAE

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

Ranunculus ficaria L. – G/H – Eca

Ranunculus neapolitanus Ten. – H – Sc – Mmne

PAEONIACEAE

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

FABACEAE

Anthyllis vulneraria L. subsp. rubriflora (DC.) Arcang.

Ornithopus compressus L. subsp. rubellus (Brign.) Grande – T – 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 sphaericaus Retz. – T – Sc – Me

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

Lotus corniculatus L. – H – Cs – C

Lotus ervoides (Brign.) Grande – T – Sc – Msp

Lotus corniculatus L. – H – Sc – C

Orrithopus compressus L. – T – Sc – Me

Scorpiurus muricatus L. – 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 cassubic a L. – H – Sc – Ecc a
Vicia medano ps Sm. – T – Sc – Es
Vicia sativa L. – T – Sc – Cs

ROSACEAE
Arem onia 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 Forsk. – P – Cs – Ms
Rosa canina L. – NP – Tmp
Rubus ulmifolius Schott – NP – Me

CRUSSONACEAE
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

HYPERICACEAE
Hypericum perforatum L. – H – Sc – 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. – P – Sc – Ec

PAPilionaceae
Ostrya carpinifolia Scop. – P – Cs – 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
Acis cerastrep – L – P – Sc – Eca
Acer opalus Mill. subsp. obtusatum (Waldst. et Kit. ex Willd.) Gams – P – Sc – Is – LR

MALVACEAE
Tilia platyphyllos Scop. subsp. platyphyllos – P – Sc – Eca

THYMELAEACEAE
Daphne laureola L. – P – Cs – Meas

CISTACEAE
Cistanthe columnae All. subsp. columnae – H – Sc – Mmne
Tecuria chaemys L. – Ch – Sf – Me

OROBANCHEAE
Bellis annua L. subsp. annua – T – Sc – Msw
Bellis perennis L. – H – Rs – Cb
Crepis longidontoides All. – H – Rs – Mmw

BRASSICACEAE
Cardamine graeca L. – T – Sc – Mn

POLYGONACEAE
Rumex acerosus L. – H – Sc – Cs
Rumex sanguineus L. – H – Sc – Eca

CARYOPHYLLACEAE
Dianthus armeria L. subsp. armeria – H – Sc – Eca
Petrorhagia saxifraga (L.) Link subsp. gispannii (Guss.) Greuter & Burdet – H – Cs – Me
Silene italica (L.) Pers. – H – Rs – Me
Silene nocturna L. – T – Sc – Mms
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 cantabricus 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-Domons) 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

OROBANCHEAE
Bellis annua L. subsp. annua – T – Sc – Msw
Bellis perennis L. – H – Rs – Cb
Crepis longidontoides All. – H – Rs – Mmw
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.

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Acronyms of the biological forms, growth forms and chorologic types

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

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

**Chorologic types.** C – Cosmopolitan; Ch – Circumboreal; Cs – Subcosmopolitan; E – European; Ea – Euroasiatic; Ec – central-European; Eca – central-European Caucasic; Ecs – central-European southern; Es – south-European; Ebs – Eurosiberian; Ese – European southwestern; Esees – south-European – south-Siberian Pontic; Esp – south-European Pontic; Ma – Med.-Atlantic; Masb – Med.-sub-Atlantic; Mec – central-Medit.; Mecw – central-Medit. western; Mm – Medit.-Mountain; Mms – Medit.-Macaronesian northern; Mnt – Medit.-Mountain northeastern; Msw – Medit.-Mountain southwestern; Ms – Medit.-Mountain; Mst – Stenomedit. Pontic; Msp – Stenomedit. Pontic; Ms – Stenomedit. southern; Msw – Stenomedit. southwestern; Omne – Orophil-Medit. north-eastern; P – Pontic; Tmp – Palao-temperate; Tmpw – Palaeotemperate western; Tps – Subtropical.


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