CONSERVATION OF FOREST DIVERSITY. THE CASE OF HUNGARIAN OAK (*QUERCUS FRAINETTO* TEN.) IN BARI BASIN (SOUTH ITALY)

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Abstract

The first observation of Hungarian oak (*Quercus frainetto*) in Bari Basin gives a chance to understand more on the ecology, the current species distribution and on the impacts of landscape modifications on forest biodiversity in the considered territory.

Bari Basin is a territory widely dominated by crops and a few specimens of Hungarian oak have been found in three different sites along and in the vicinity of some ephemeral erosion streams that are the peculiar landscape elements of the considered territory. Hungarian oak is quite rare in Bari Province where occurs mainly in Bradano Trench, in ecological conditions more similar to the Lucanian Apennine where *Q. frainetto* is abundant. The superficial soils on Cretaceous limestones of Murgia Plateau are not optimal for the species but more favourable conditions occur on the alluvial deposits along the erosion streams where the Hungarian oak has been observed.

The aim of the paper is to show how the anthropological impact that has transformed Bari Basin in an agricultural landscape has seriously affected forest diversity and complexity in the considered district.

Key words: forest diversity, agricultural landscape, ephemeral streams, Hungarian oak, Bari Basin, restoration

INTRODUCTION

Bari Basin (Conca di Bari) is a Regional geographical district (Fig. 1) that starts in the territory of Bari and crosses the Low Murgia Plateau (Murgia Bassa) till the High Murgia escarpment in Cassano delle Murge area (Baldacci, 1962). The land use as it happens in the whole Low Murgia Plateau is dominated by crops, olive trees above all, while grapes and cherry trees are spread in the Southern-Eastern part of Bari Basin. Important landscape elements are numerous erosion ephemeral streams flowing across the study area. Along slopes and rocky banks of ephemeral streams survive the most important spontaneous coenoses of the district. Management of these residual habitats is fundamental also considering that agricultural lands cover
over 40% of the terrestrial surface (Foley et al., 2005) and in the European Union support a considerable proportion of the wildlife (Pimentel et al., 1992).

The more typical forest species of the study area is Palestine oak (*Quercus calliprinos* Webb) that forms maquis and remnant patches of forest, and can be appreciated along slopes of the ephemeral streams and as well in the fields along the stone walls and the rural roads. Bari Basin covers the great part of Northern area of Apulian natural distribution of Palestine oak, which is also Italian Peninsular distribution, excluding a coenose in the vicinity of Senise in Basilicata Region.

Often in the maquis can be observed sclerophyllous shrubs as *Rhamnus alaternus* L., *Pistacia lentiscus* L., *Phillyrea latifolia* L., while Holm oak (*Quercus ilex* L.) in the district appears where does not occur anymore Palestine oak, as described in the case of the most Southern-Eastern erosion stream of Bari Basin, Lama Giotta (Carella, 2012).

Among the broadleaved trees Italian pubescent oak (*Quercus virgiliana* (Ten.) Ten.) is more abundant in the inner Bari Basin (Carella, 2013), while Macedonian oak (*Quercus trojana* Webb) species of great phytogeographical interest for its Balkanic character of its natural distribution range (Lorenzoni, Ghirelli, 1988) starts to appear.

![Geographical districts of Puglia Region](image)
just on the Southern-Eastern margin, along Lama San Giorgio, with the exception of a small coenose located in the inner Bari Basin, along the higher course of Torrente Picone (Carella, 2011).

Another forest species, Carob tree (*Ceratonia siliqua* L.) forms thermophilous maquis that occur on the rocky slopes and banks of the lower courses of erosion streams and live as well in olive fields. The value of Carob trees depends on its relevance to biodiversity conservation (European Commission, 2007), for landscape, due to the large dimensions of the specimens and for wintering Passerine birds that use the large evergreen crown as refuge.

Hungarian oak (*Quercus frainetto* Ten.) has been found for first time in Bari Basin along and in the vicinity of some dry erosion streams and these new records give further information about the ecology and natural distribution of this Southeastern European species with special attention to the considered territory.

**METHODS**

Hungarian oak has been found in Bari Basin in three different sites (Fig. 2). After its first occasional observation occurred during field surveys in the spring of 2009, all the district has been investigated for better comprehension of the species in considered territory where the species was not listed before. Thus in the period 2009-2012 the relict forest patches and the solitary oaks occurring in the district have been analysed leading to the results here reported.

![Fig. 2. Location of the 3 sites of the Hungarian oak in Bari Basin](image-url)
RESULTS

Climate in the area is typically Mediterranean with hot and dry summers, more severe in the last years as consequence of the climate change and rainfalls concentrated in fall-winter. The area can be referred to Apuliana Sub-Province, of Adriatica Province, of Eastern Mediterranea Sub-Region, of Mediterranean Region according to Rivas-Martinez (2004). The mean annual temperature and the average yearly precipitation recorded in Bari-Palese over 30 years (1967-1996) is 16°C and 619 mm.

Table 1 provides information on different sites. A solitary large Hungarian oak has been found in the lower course of the erosion stream Torrente La Badessa, one of both branches of Torrente Picone, one of the most important erosion streams of Bari Basin (Mossa, 2007). The specimen occurs a few hundred meters from Torrente La Badessa in an olive field along a stone wall, where live as well some specimens of Palestine oak, in the Bitritto territory.

Table 1
Characteristics of the three sites

<table>
<thead>
<tr>
<th>Site 1</th>
<th>Bitritto (on the border with Bari)</th>
<th>115</th>
<th>A large solitary specimen</th>
<th>Torrente La Badessa (lower course)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 2</td>
<td>Modugno</td>
<td>75-90</td>
<td>A few specimens in remnant wooded patches of Italian pubescent oak</td>
<td>Lama Lamasinata (lower course)</td>
</tr>
<tr>
<td>Site 3</td>
<td>Acquaviva delle Fonti</td>
<td>250-270</td>
<td>A few specimens in an Italian pubescent oak forest</td>
<td>Torrente La Badessa (upper course)</td>
</tr>
</tbody>
</table>

In the site 2 Q. frainetto (Fig. 3) has been found with a few specimens spread in small residual wooded patches dominated by Quercus virgiliana that occur along and in the vicinity of the lower course of another important erosion stream, Lama Lamasinata (Fig. 4), in Modugno municipality.

In the site 3 Hungarian oak has been observed with a few specimens in an Italian pubescent oak remnant forest patch that occurs inside the upper course of Torrente La Badessa ephemeral stream in the municipality of Acquaviva delle Fonti.

DISCUSSION

Hungarian oak is a mesophilous deciduous oak, quite similar to ecology to Turkey oak (Quercus cerris L.), thus it often lives in mixed coenoses with Q. cerris in the Central-Southern Appennine, where occurs the Italian natural distribution range for the species (Pignatti, 2002).
In the Province of Bari Hungarian oak occurs at Difesa Grande Forest in the municipality of Gravina di Puglia (Bianco et al., 1991) where it lives with *Q. cerris* and *Q. virgiliana*. This forest stand, the largest spontaneous forest coenoses of the whole Province, is located at the margin of Bari Province in an area that differs from the rest of the territory characterized by Cretaceous limestone of Murgia Plateau and that is more similar to ecology of Appennine. In particular, the Difesa Grande Forest occurs in Bradano Trench, a morphologically depressed area between Murgia Plateau and Lucanian Apennine, where Hungarian oak is quite abundant (Gavioli, 1935).

In the higher part of Murgia Plateau, in the Northern-Western part of the Plateau, spontaneous forests are mainly represented by deciduous coenoses dominated by *Q. virgiliana* where *Q. frainetto* generally does not occur, while *Q. cerris* appears sporadically.

For first time, Hungarian oak has been observed in Bari Basin along and in the vicinity of some erosion streams. In Murgia Plateau characterized by Cretaceous limestone, just along the erosion streams occur deep soils, originated on continental alluvial deposits of Upper Pleistocene-Holocene (Azzaroli, Valduga, 1967).

*Q. frainetto* finds unexpectedly in a difficult region for its ecology as Murgia
Plateau, favourable conditions along the deep alluvial soils of the courses of the dry erosion streams flowing in Bari Basin.

Nevertheless, now really sporadic, it can be supposed that before the land use modifications occurred, Hungarian oak may have had a role in the original woodlands of Bari Basin, in particular in mesophilous valleys along the erosion streams. It is important to underline that the whole Low Murgia Plateau is one of the Regional geographical districts mostly altered by agricultural practices and that these modifications started already in the historical period, driving to deep ecosystems simplification and forest diversity loss. Further considerations are related to the ecology of the species since *Q. frainetto* is a sensitive one that can have problems of regeneration in secondary forests (Gellini, Grossoni, 1997), as confirmed by a low competitive power after coppicing, fires and grazing (Cameriere et al., 2003).
Decline of Hungarian oak in Bari Basin and its almost total disappearance is probably the result of the modifications started with the destruction of native forests. Others authors have already adopted similar conclusions to explain the fragmented natural range of distribution of *Q. frainetto* in the Central-Southern Appennine (Abbate et al., 1987). Thus, it is possible that the remnant forests occurring along the erosion streams have significant differences in species composition (Hobbs, Huenneke, 1992) compared to the primary forests and that the changing of environmental conditions launched with the destruction of the native woodlands are causing a progressive deterioration of the more mesophilous and exigent coenoses.

**CONCLUSIONS**

This new data on *Quercus frainetto* in a territory so deeply affected by the agricultural practices as Bari Basin and the whole Low Murgia Plateau is with a great value and contribution to biodiversity and forest conservation, showing the role played by ephemeral streams that in the considered district support biodiversity becoming refuge areas for species and habitats. The first observations of Hungarian oak in Bari Basin are a further aspect for better understanding of ecology and natural distribution of the species and at the same time a confirmation of the value of Puglia Region for natural distribution of *Quercus* species, for this reason well known as oaks land (Carano, 1934).

Nevertheless agricultural practices have deeply altered the study area with dramatic ecosystems simplification, the original mosaic complexity can be still evident (Fig. 5) as it happens with different types of residual forest patches that can be observed in particular along the ephemeral streams.

The adoption of strategies leading to a strong preservation of the native remnant habitats (McKinney, 2002) and afterwards to an adequate landscape management focusing on the restoration of the native habitats in managed and ruderal ones, starting from small patches (Dudley et al., 1986) of native forest species, can enhance significantly forest diversity and ecological connectivity of Bari Basin and could represent a fundamental strategy to manage the new scenery under the climate change (Biringer, Hansen, 1986).

The conservation and the restoration of Hungarian oak forest patches represent the last step of this desirable process, since its coenoses are the most sensitive and exigent ecotope in the landscape mosaic of Bari Basin.

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Fig. 5. Forest diversity in a well preserved ephemeral stream


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