Comunicazioni

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THE LAST GENNARGENTU DOWNY OAK GIANTS

1. Introduction

Among oaks species spread in the temperate regions of Southern Europe, the downy oak (*Quercus pubescens* Willd.) is spontaneous from Iberian Peninsula up to Balkan Peninsula (Pignatti, 1982; Schwarz, 1993; Gellini & Grossoni, 1997). The *Q. pubescens* was frequently classified with different observations in account of its variable morphological characters, but its yet clear not equivocal systematic collocation. Because this phenotypic polymorphism, the exact distribution does not appear to be easily delimited (Bussotti & Grossoni, 1997). In Sardinia the natural vegetation range of the downy oak includes the central and northern part of island with preference for the cold wet horizon of the climax of *Quercus ilex* forest (Gellini & Grossoni, 1997; Arrigoni, 1968; Arrigoni, 2006). Ancient expansions and following withdrawals were possible within particular eco-microclimatic conditions (Puxeddu, 1997). The impact of human activity has determined a strong alteration of the natural vegetation and at the present, some forest can be considered relic ancient woods: the higher land of Gennargentu mountain represents a typical example of this situation (Puxeddu & Citterio, 2009). In this area the conservation of the last residual *Q. pubescens* primeval forest (Figures 1 and 2), is the main objective for a correct management. Because the knowledge of history and dynamic of the variation of the forest cover is essential support to define the conservation strategies and the recovery methods, we have carried-out a new space/time inventory to describe the actual situation having as reference the data collected with a previous work (Citterio *et al*., 2007). With this new set of data, the observations cover a period of 28 years (1977-2005).

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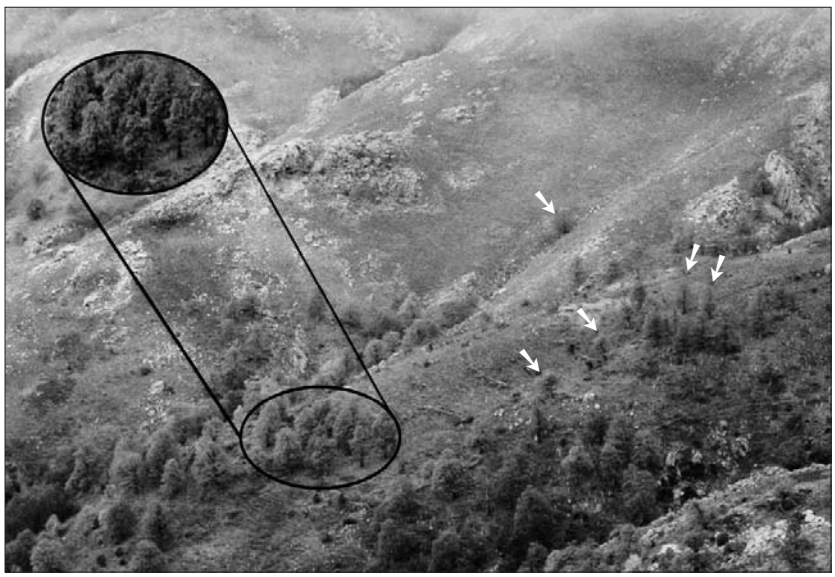

Figure 1 – Downy oak relic ancient woods.

Figure 2 – Downy oak isolated remains.

2. Materials and methods

As study area we considered the upper land of Gennargentu mountains located over contour line (isoipsa) of 1200 m a.s.l., about 10,000 hectares in surface (Citterio *et al.*, 2007). Two orthogonal subareas (Fig. 3), 900 ha the first (North East-South West oriented) and 750 ha the second (North West - South East oriented), were selected as representative of the situation. In each of them, we have applied a space/time analysis by multitemporal carthographic methods, using aerial photographs ERSAT 1977 and digital orthophoto of AIMA IKONOS satellite coverage of 1997 and 2005 years that allowed the knowledge of the variation of two typologies of forest cover recognized: the first related with the presence of the stand defined according to the actual wood settlement (De Natale *et al.*, 2003), the second that one realized by the isolated single trees. Just only for the 2005 year we have also estimated the group of trees defined where the density and the largeness of the crown of tree (more than 2 together) determined a visible and real forest cover of the soil. All trees were monitored and assigned to the respective typologies. We have also calculated the surface occupied by each group considering the boundary of the group with the projection on the soil of the crown of the trees located on the board of the group. The groups were divided in three classes of surface cover: < 1.0, from 1.0 to 2.0, > 2.0 hectares respectively.

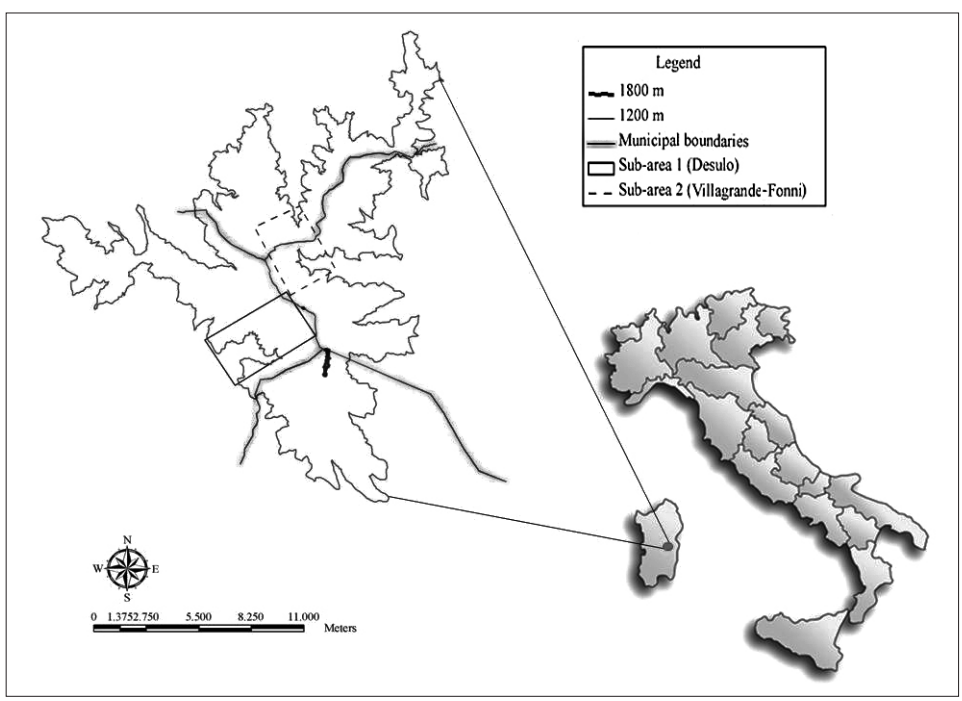

Figure 3 – Study area with subareas location.

3. Results

The space/time analysis showed that during the last 28 years (Tab. 1) an high reduction of *Q. pubescens* relic ancient woods occurred: from 246 hectares in 1977 to 158 hectares in 2005 (-35.78%), and a strong reduction of the isolated single trees: from 4883 to 907 in 1977 and in 2005 (-85%) respectively, correspondent to a density variation average from 3.40 to 0.6 trees per hectare. For the 2005 year we have characterized 40 and 60 groups of trees in the subareas 1 and 2 respectively (Tab. 2). The 84% of all groups results to be included in the class of surface cover of <1,0 hectare (average value of 0,43 hectare).

Table 1 – Relic ancient woods surfaces and isolated remain oaks.

Years	*Sub-area 1 (Desulo)*			*Sub-area 2 (Villagrande-Fonni)*		
	Relic ancient woods surfaces (ha)	Isolated remains oaks (tot. n.)	Isolated remains oaks ($t.ha^{-1}$)	Relic ancient woods surfaces (ha)	Isolated remains oaks (tot. n.)	Isolated remains oaks ($t.ha^{-1}$)
1977*	168	1723	2.35	78	3160	4.46
1997*	119	669	0.86	56	553	0.8
2005	107	477	0.6	51	430	0.6

*by Citterio *et al.* (2007).

Table 2 – Number of groups in 2005.

Sub-area 1 (Desulo)		*Sub-area 2 (Villagrande-Fonni)*	
Surface (ha)	Groups (n.)	Surface (ha)	Groups (n.)
< 1	37	< 1	47
1-2	2	1-2	7
>2	1	>2	6

4. Discussion and conclusions

As it has already found by Citterio *et al.* (2007) the occurrence of downy oak (*Quercus pubescens* Willd.) in the upper range of Gennargentu mountains follows to decrease. The new data confirmed the relic character of the forest characterized by a mosaic structure where the presence of groups, more or less large, of trees, is associated with scattered single trees. As matter of fact that these ecosystems are into a National Park, it is urgent to adopt management strategies that help the conservation of these forest covers, particularly through the planning of interventions finalized to an absolute protection of this relic ancient forest.

SUMMARY

The last Gennargentu downy oak giants

The impact of human activity has determined a strong alteration of the forests in Sardinia. A particular example is founded by the downy oak (*Quercus pubescens* Willd.) relic forest located in the upper side of Gennargentu mountains. A space/time inventory by GIS software and multitemporal cartographic methods showed the variation of the distribution of the species during the last 28 years. The dramatic reduction of forest cover and of the number of residual trees represents a serious danger to the conservation of the genetic variability of this species.

Key words: downy oak; relic wood; conservation; Sardinia.

RIASSUNTO

Gli ultimi giganti di roverella del Gennargentu

In Sardegna l'impatto dell'attività antropica ha determinato una forte alterazione delle foreste. Un particolare esempio in tal senso è dato dalle foreste relitte di roverella (*Quercus pubescens* Willd.) localizzate nella porzione più elevata dei monti del Gennargentu. Un inventario spazio/tempo condotto mediante software GIS con metodi cartografici multitemporali ha mostrato la variazione della distribuzione della specie negli ultimi 28 anni. La drammatica riduzione della copertura forestale e del numero delle singole piante relitte rappresenta un serio pericolo alla conservazione della variabilità genetica di questa specie.

Parole chiave: roverella; boschi relitti; conservazione; Sardegna.

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