

Sporadic tree species as a key element for the restoration of Mediterranean forests

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Introduction

The importance of sporadic tree species (STT) for biodiversity conservation in forest ecosystems is since long time recognized. The richness of tree species has also been considered among the Criteria & Indicators of Sustainable Forest Management adopted under the Ministerial Conference on the Protection of Forests in Europe (MCPFE 2003). However, when dealing with the restoration of Mediterranean forests, usually, the replacement of pines and eucalypts used in afforestation is mostly made with few broadleaved tree species (mostly *Quercus* or *Fraxinus* spp.). Moreover, present-day natural forests (e.g., beech or holm oak stands), often issuing from former coppice woods, are in most cases tree species-poor. Thus, the issue of rebalancing the composition of Mediterranean forests is seldom addressed. Although the recent guidelines of sustainable forest management emphasize the importance of fostering rare woody species, sufficient time has not elapsed for significant results to be observed yet.

Study area

The research was carried out in Sicily (Mediterranean Italy), where the original forest cover was almost totally destroyed in historical times (Figure 1). Moreover, selective cutting has favoured the spread of oaks that gave the best charcoal and firewood and cork and chestnut for non-wood products. Conversely, over time there has been a strong reduction in the abundance and cover of the tree species considered unprofitable from an economic point of view.

Materials and Methods

In our research, first of all, we searched for a definition of sporadic tree species in Italian literature, including grey and legislative texts. Then, based on dedicated field surveys and literature data from the phytosociological surveys performed on Sicily, we identified the sporadic tree species occurring in forest ecosystems. Part of the field surveys were carried out within the Convention established between “Dipartimento Regionale dello Sviluppo Rurale e Territoriale” and Department of Agriculture, Food and Forest Sciences, University of Palermo.

We excluded the tree species matching with the following criteria:

1. potentially dominant or rather common (e.g., *Fagus sylvatica*)
2. no longer observed for centuries (e.g., *Carpinus orientalis*)
3. species whose native distribution range and origin are doubtful (e.g., *Mespilus germanica*, *Laurus nobilis*)
4. Species that do not thrive in forest habitats (e.g., *Genista aetnensis*)
5. Hygrophilous species, i.e., plants that grow in swamps and/or along riversides (e.g., *Alnus glutinosa*)
6. Species whose systematic value needs further research with modern investigation tools (e.g., genetics)

Results and Pinpoints

- A shared definition of STT in Italy is lacking.
- In forestry literature, a similar concept of STT is that of accessory species, that are considered tree species which, despite having a lower economic value, are useful for promoting the growth of the main tree species or for preserving soil fertility (Bernetti et al., 1980).
- A more recent general definition is: “any tree species that, in a given territory, can be rarely found” (Mori & Pelleri, 2012), thus suggesting a strong influence of local factors.
- We identified 20 STT thriving in forest ecosystems in Sicily (Table 1, Figure 2).
- The rarity of these species is mostly related to their peculiar ecological requirements, but it has been also strongly affected by past management and selective cutting. Indeed, we also found small nuclei dominated by STT (Figure 3)
- Many forest regulations in Italian regions (e.g., Regulation 48/2003 for Tuscany) include the conservation of STT during forest harvesting in regularly managed forests.
- Specific guidelines for the silviculture of STT have been recently proposed (Mori et al., 2007).

Conclusions

- The reintroduction of STT should be carefully considered for the restoration of specie-rich Mediterranean forests.
- This need is seriously constrained by seedling availability in the forest nurseries in Sicily, where STT are generally lacking.
- To restart the propagation of these species, seed collected from the nearest woods should be used, thus ensuring the conservation of germplasm adapted to local conditions and increasing plant survival and establishment success.
- The knowledge of seed-dispersal networks of STT should be deepened.
- Specific silvicultural options should be provided for the protection and for increasing cover of STT in Sicilian woods, following the examples of Forest Regulations adopted in other Italian regions (Tuscany, Piedmont, Calabria and Emilia-Romagna)

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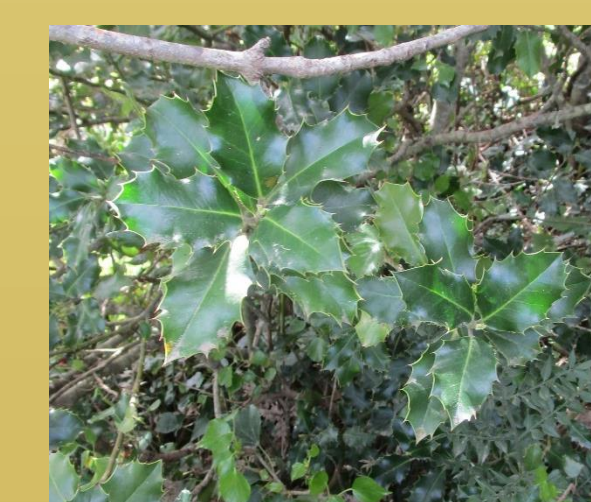
Figure 1. (a) Hypothetic tree cover in Sicily prior to the large-scale forest disruption induced by human activity; (b) The island’s forest cover in the mid 19th century; (c) the current forest cover of Sicily (≈ 275.000 hectares) according to the regional Forest Inventory; about one third of the present-day forests are plantations (Hofmann et al., 2011)

Table 1 – Sporadic tree species occurring in Sicilian woods. Bold type for Sicilian endemics. P/F = Presence/Frequency: C = common, L = localized, R = rare, RR = very rare. DT = Demographic Trend: D = decreasing, I = increasing, S = stable, NA = not available. RF = Risk Factors: CC = climate change, HD = habitat degradation, HF = habitat fragmentation, GP = genetic pollution, PA = parasitic attacks. (from La Mantia & Pasta 2005, modif.)

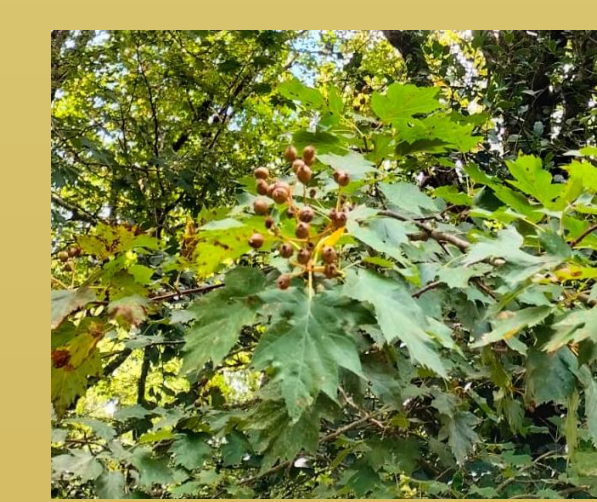
ID	Taxon	Family	P/F; DT; RF
1	<i>Abies nebrodensis</i> (Lojac.) Mattei	Pinaceae	RR; S; CC, HD, HF, GP
2	<i>Acer campestre</i> L.	Sapindaceae	C; NA; HD
3	<i>Acer monspessulanum</i> L.	Sapindaceae	L; NA; HD
4	<i>Acer obtusatum</i> Waldst. & Kit.	Sapindaceae	L; NA; HD
5	<i>Acer platanoides</i> L.	Sapindaceae	R; D; HD
6	<i>Acer pseudoplatanus</i> L.	Sapindaceae	R; S; HD; GP
7	<i>Euonymus europaeus</i> L.	Celastraceae	R; D; CC, HD
8	<i>Fraxinus excelsior</i> L. subsp. <i>siciliensis</i> Ilardi & Raimondo	Oleaceae	RR; NA; CC, HD, PA
9	<i>Ilex aquifolium</i> L.	Aquifoliaceae	L; S; CC, HD, HF
10	<i>Malus sylvestris</i> (L.) Mill.	Rosaceae	L; NA; CC, HD
11	<i>Ostrya carpinifolia</i> Scop.	Betulaceae	L; S; CC, HD
12	<i>Prunus mahaleb</i> L.	Rosaceae	L; NA; HD, GP
13	<i>Quercus petraea</i> (Mattuschka) Liebl. subsp. <i>austrorhena</i> Brullo, Guarino & Siracusa	Fagaceae	L; S; CC, HD
14	<i>Rhamnus cathartica</i> L.	Rhamnaceae	R; NA; CC, HD
15	<i>Sorbus aria</i> (L.) Crantz s.l.	Rosaceae	L; D; CC, HD
16	<i>Sorbus domestica</i> L.	Rosaceae	L; D; CC, HD
17	<i>Sorbus torminalis</i> (L.) Crantz	Rosaceae	L; S; CC, HD
18	<i>Taxus baccata</i> L.	Taxaceae	R; S; CC, HD
19	<i>Tilia platyphyllos</i> Scop.	Malvaceae	RR; S; CC, HD
20	<i>Ulmus glabra</i> Huds.	Ulmaceae	R; NA; CC, HD, PA

Figure 2.

Some examples of STT found in some Sicilian forest ecosystems



Holly
(*Ilex aquifolium*)



Wild service tree
(*Sorbus torminalis*)



Mahaleb cherry
(*Prunus mahaleb*)



European hop-hornbeam
(*Ostrya carpinifolia*)



European crab apple
(*Malus sylvestris*)



European spindle
(*Euonymus europaeus*)

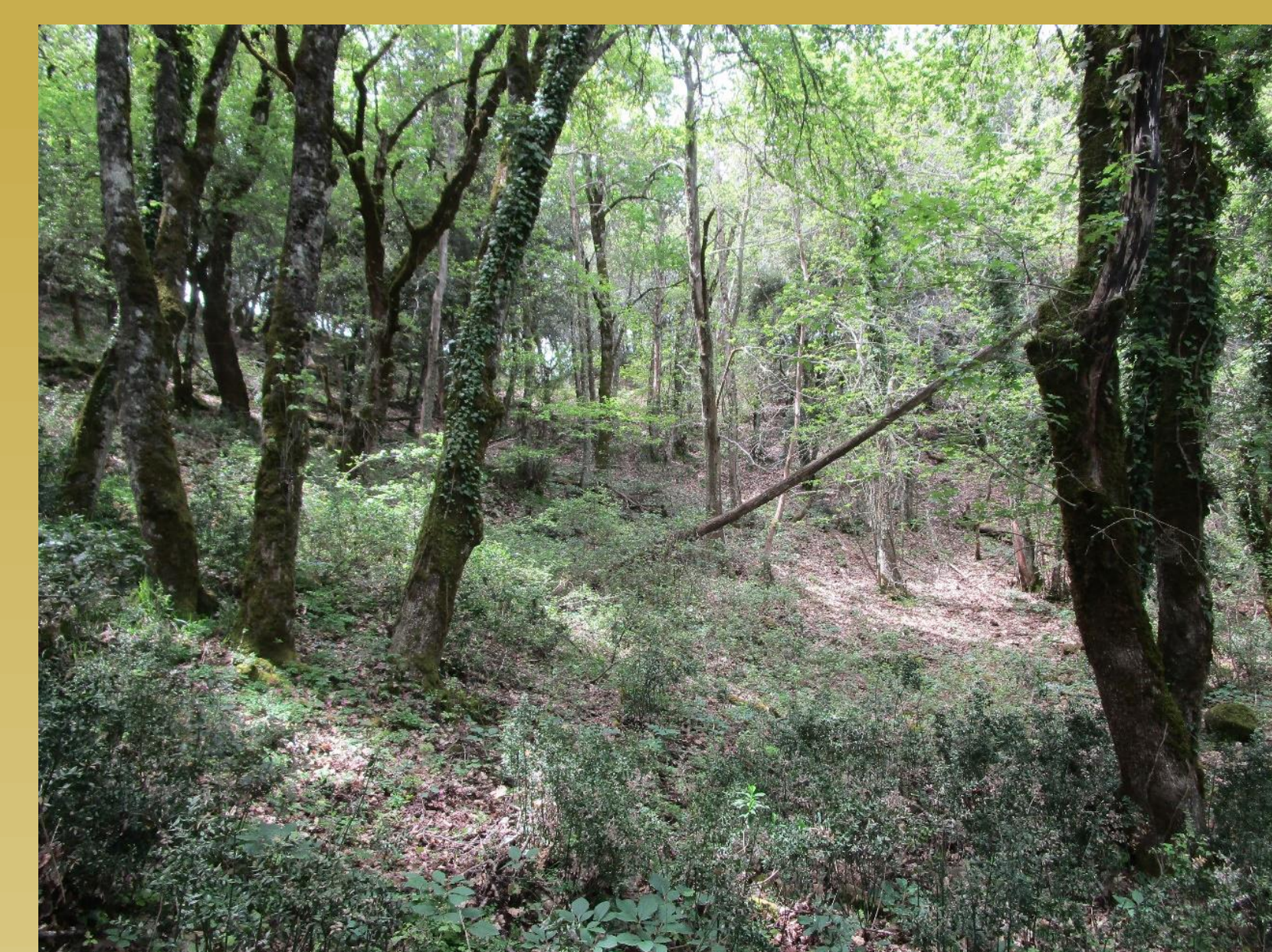


Figure 3. Thicket dominated by large *Sorbus torminalis* trees at Ficuzza wood.