The effects of environmental features and overstory composition on the understory species assemblage in sub-Mediterranean coppiced woods: implications for a sustainable forest management

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ABSTRACT

Understanding the relationship among environmental factors, overstory and understory is a key step for the improvement of sustainable forest management. Our aim was to understand how environmental features (topographic factors) and overstory (tree species) composition affect understory (shrub and herb species) assemblage in sub-Mediterranean coppiced woods. The study area lies in the Monti Sibillini National Park (central Italy). In 205 plots (20 × 20 m) we collected topographic features and species cover values; moreover, we defined the Social Behaviour Type (SBT – *i.e.* species ecological and dynamic features) of each understory species. Data were analysed using Redundancy Analysis and Generalized Linear Modeling. We found that topographic factors shaped percentage cover of different tree species and hence determined forest community type. Topography-related factors were further mediated by the tree layer composition, in filtering understory assemblage, on the basis of species SBT. We found no effect of overstory species diversity on understory species diversity. However, the presence of tree species different from the dominant ones increased understory species richness. This effect was particularly notable in evergreen woods, dominated by *Quercus ilex*. We conclude that, to improve the management sustainability, coppicing management should be focused on the achievement of the greater tree species diversity.

INTRODUCTION

Understanding the driving forces of community composition is one of the major goals in vegetation ecology and management (Gilbert and Lechowicz 2004, Freestone and Inouye 2006). In forest ecosystems, species assemblages are related to several factors, such as environmental gradients (Čarni *et al.* 2011, Arevalo *et al.* 2012), past geographical and climatic events (Chytrý *et al.* 2002, Kuželova

and Chytrý 2004), and land use history (Decocq *et al.* 2004, Hérault and Honnay 2005). Moreover, species composition, community structure and functions proved to be related each other (Franklin *et al.* 1981, Noss 1990, Marchetti *et al.* 2010). In particular, there are several clues that overstory and understory composition are related to some extent, since tree canopy composition affects soil nutrients and the physical environment of the forest floor (Augusto *et al.* 2002, Hart and Chen