

Abstract

Fire recurrence effects on biodiversity and community structure in Sanabria Natural Park (Spain)

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In Sanabria Natural Park (Castilla y León Region, Spain), fires are a frequent occurrence mostly caused by humans. The aim of this study was to determine the effect of fire recurrence on the structural characteristics, in particular biodiversity, of different communities in this area. Fourteen sites, ten heathlands dominated by *Erica australis* and four *Quercus pyrenaica* stands, two mature oak forests and two oak shrublands, were chosen in a total surface area of 30 km². All of them had different levels of fire recurrence and different ages since the last fire. Data on fires occurring in the whole study area since 1990 are available. Sampling was carried out in July 2005. A 10 × 10 m² plot was located in the centre of each site; in each plot, ten 1 m² quadrats, systematically situated at equal distance from each other, were studied and all the species present were quantified as visual cover percentage. A sampling by layers was also carried out in the same quadrats, estimating total plant cover in each layer (0–0.5 m, 0.5–1 m, 1–2 m, 2–4 m, 4–8 m and >8 m). Plant species diversity was measured as richness (number of species). Alpha diversity, or small-scale diversity (diversity/m²), gamma diversity (diversity/plot or site), and beta or pattern diversity ($S_{\beta} = S_{\gamma}/\text{mean } S_{\alpha}$) were analysed. Besides total S_{γ} , annual species number, perennial herbaceous species number and woody species number were also considered. As well as species diversity, structural diversity was calculated by the Shannon index using plant cover data in the different layers. H'_{α} , H'_{γ} and H'_{β} ($H'_{\beta} = H'_{\gamma} - \text{mean } H'_{\alpha}$) were calculated. An affinity analysis was carried out considering all the species

present. The dendrogram showed two groups: *Erica australis* heathlands and *Quercus pyrenaica* oak stands. The effect of fire recurrence on species composition was not observed in either case. A PCA was carried out in order to determine whether recurrence or the time elapsed since the last fire had any effect on species diversity or community structural diversity. Differentiation between the oak stands and the heathlands was also observed in this case. There was higher herbaceous species richness and more structural diversity in the oak stands. Stratification was noticeably lower in the heathlands, although they usually had higher woody species diversity. No ordination depending on the time elapsed since the previous fire or recurrence was observed. Therefore, changes in community structure caused by fire recurrence in a relatively short period, such as that considered (15 years), are not noticeable in areas adapted to frequent fires. Nevertheless, repeated fire impedes the progress of succession and slows it down its initial immature stages. These recover by autosuccession following repeated fire and persist as heathlands or oak shrublands. On the other hand, although fires occur in mature oak forests, only the understory is affected, thus maintaining greater diversity and structural complexity.

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