

Species richness in Sea-Buckthorn scrub

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Abstract

The expansion of Sea-Buckthorn in dunes reduces species richness as well as the cover of mosses and lichens. The decrease in species richness is likely to be due to the shading effect of the scrub. As many regionally rare plants are restricted to dune areas, the spreading of this densely growing scrub might be a serious threat to the phytodiversity of open semi-fixed dunes.

Keywords: *Hippophae rhamnoides*; Scrub encroachment; Relative irradiance; Species richness.

Introduction and methods

In many coastal dune areas of north-western Europe scrub such as Sea-Buckthorn (*Hippophae rhamnoides*) is currently spreading, because of changing land use during the last two centuries. Shrubs were originally planted for coastal protection and have since then increased in abundance often due to the decline in cattle and rabbit grazing (Fuller and Boorman, 1977). The main purpose of this study was to determine whether the expansion of Sea-Buckthorn and the shading-out effect affects species richness.

We investigated the vegetation of Sea-Buckthorn scrub at seven sites on the island of Schiermonnikoog (The Netherlands). At each site, three neighbouring plots (each 2m²) significantly differing in shrub cover (on average 88, 55 and 19%, One-way ANOVA $p < 0.001$) were compared. Relative irradiance was determined by measuring the light values above and beneath the scrub and by calculating the ratio of the two values. The species composition of vascular plants and cryptogams was sampled in each plot and analysed by means of Detrended Correspondence Analysis (DCA) of cover weighted species using PC-ORD.

Results

The species composition in the three site types differed considerably (Fig. 1).

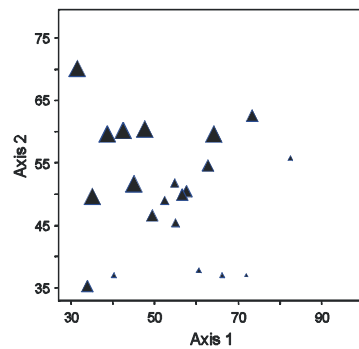


Fig. 1. Ordination of plots. The size of the plot symbol reflects the cover of shrubs.

At the upper left of the diagram plots with high shrub cover are found, at the lower right are situated those with low shrub cover.

Species richness decreased with increasing shrub cover, both with respect to total species number (Fig. 2) and with regard to the number of herbs and grasses as well as the number of mosses and lichens.

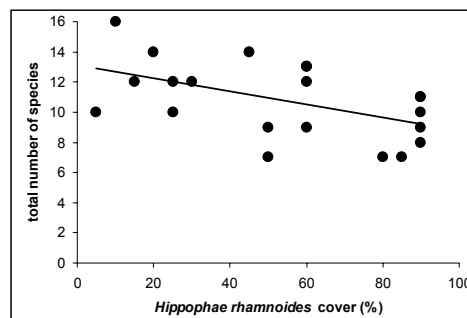


Fig. 2. Relationship between the shrub cover of *Hippophae rhamnoides* and total species number ($R^2_{adj.}=0.226$, $p=0.017$).

Although the overall number of mosses and lichens was very low, their cover reached high values of up to 75% in the more open Sea-Buckthorn scrub. The cover of mosses and lichens decreased strongly with increasing shrub cover to values less than 20% (Fig. 3).

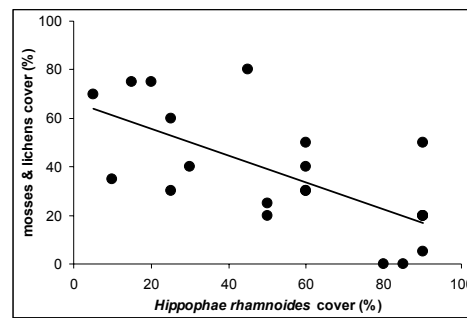


Fig. 3. Relationship between the shrub cover of *Hippophae rhamnoides* and the cover of mosses and lichens ($R^2_{adj.}=0.421$, $p=0.001$).

In very open shrubland the relative irradiance beneath the scrub reached about the same level as above the scrub (Fig. 4). The light intensity decreased strongly when shrub cover increased to about 20%, then the decrease proceeded at a lower rate. In closed scrub the relative irradiance at ground level reached only about 10% of that above the scrub.

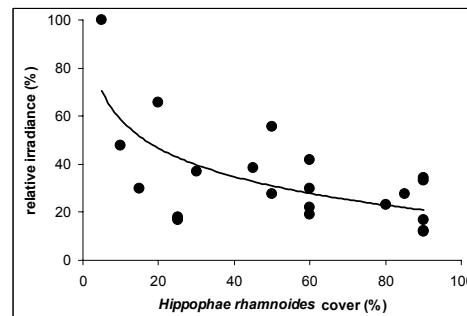


Fig. 4. Relationship between the shrub cover of *Hippophae rhamnoides* and the relative irradiance beneath the scrub ($R^2_{adj.}=0.296$, $p=0.016$).

Discussion

The number of species decreased with increasing shrub cover, probably because of the strong decline in the relative irradiance beneath the scrub. In a similar study of Sea-Buckthorn scrub in Irish dunes the total number of species decreased more strongly by 50% (Binggeli *et al.*, 1992). In general, depending on growth form and foliage, the shading-out effect of scrub varies. The extent of the decrease in the number of species due to the shading-out effect depends on plot size; in smaller plots a marked decrease is already reached in the case of lower shrub cover (Rejmánek and Rosén, 1988). In dune

areas many regionally rare plants are found (Dunwiddie, 1997), hence the expansion of densely growing shrub species might be a serious threat to open semi-fixed dunes.

Acknowledgements

We thank Martin Diekmann for his critical comments on earlier drafts of the manuscript.

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