OC08 - Effects of ecological drivers to a spatial and temporal scale on macrophyte assemblages in a Mediterranean shallow lake

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INTRODUCTION

In this study we examined the relative influence of some ecological drivers to a spatial and temporal scale on aquatic macrophye assemblages of a shallow Mediterranean lake, considering climate as a spatiotemporal global factor, land use as a spatiotemporal regional factor and habitat and water chemistry as a local spatiotemporal factor. At the same time, we analyzed the composition and dynamics of settled materials on summer and winter with the aim to characterize the silting risk and its influence on ecological succession of macrophyte communities.

METHODS

This study was performed in Sentiz lake (42º 33' 22'' N, 5º 12' 26'' W, altitude: 940 m), a small (maximum area = 4,5 ha), permanent and shallow (mean depth = 80 cm) water body that suffers significant reduction in water surface area during summer. Sentiz is located in the northwest of Spain in an agricultural landscape

Statistical analyses

We analyzed 26 environmental variables, distributed in three groups along a spatial and temporal scale (climate, land use and habitat and hydrochemistry) to determine their influence on macrophyte community of Sentiz lake (Del Pozo et al., 2011).

RESULTS AND DISCUSSION

Our results showed a temporal change pattern in the composition of macrophyte assemblages from nutrient-sensitive submerged hydrophytes (*Myriophyllum alterniflorum* and *Chara fragilis*) and small helophytes (*Eleocharis palustris*, *Alisma plantago-aquatica* and *Glyceria fluitans*) to nutrient-tolerant floating-leaved and submerged hydrophytes (*Polygonum amphibium*, *Potamogeton natans*, *Potamogeton trichoides* and *Ceratophyllum demersum*) as well as tall helophytes (*Typha latifolia* and *Scirpus lacustris*).

We found strong relationships between environmental drivers and the functional composition of macrophyte community. Our results showed a positive correlation between tall helophytes and agricultural land use ($r = 0.88$; $p < 0.05$) and an inverse relationship between emergent macrophytes and shore vegetation ($r = -0.92$; $p < 0.05$). Short helophytes coverage was related to climate, in particular with mean annual precipitation ($r = -0.89$; $p < 0.05$) while floating-leaved and submerged hydrophytes correlated with habitat (depth; $r = -0.88$; $p < 0.05$) and water chemistry (TSS; $r = 0.99$; $p < 0.05$), respectively.

The influence of different environmental drivers on biological communities of shallow lakes has already been detected by some authors (Sass et al., 2010; Del Pozo et al., 2011). In the case of Sentiz lake, it was observed a differential interaction between the different aquatic vegetation growth forms and environmental drivers in a spatial and temporal scale. Water chemistry defined the coverage variations of submerged hydrophytes, while habitat, land use and climate explained the changes occurring on floating-leaved hydrophytes and tall and short helophytes, respectively (Fig. 1).

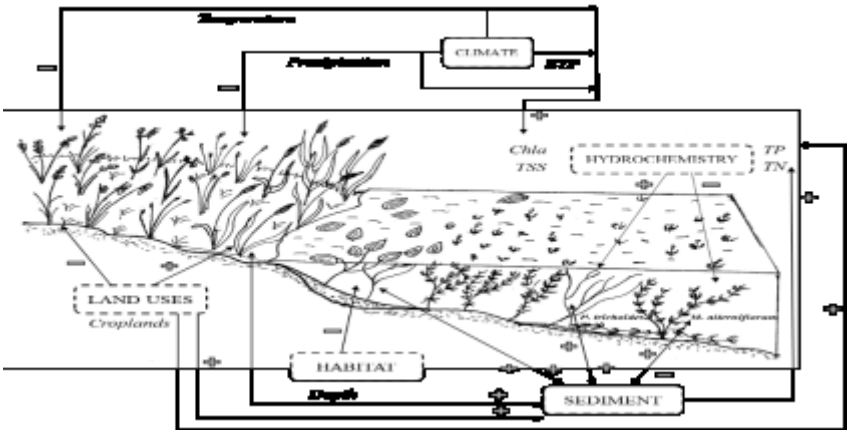

Fig. 1. Principal interactions between environmental variables, aquatic macrophytes and sediment fluxes. Add symbols (+) represent direct and positive interactions while subtraction symbols represent inverse and negative interactions.

CONCLUSIONS

This study revealed a differential influence of some ecological drivers to a spatial and temporal scale on helophytes, submerged and floating-leaved hydrophytes. Changes registered in water chemistry, as well as in the land use of the catchment area, on a climate change scenario, have accelerated morphological and structural transformations in Sentiz lake, increasing trophic state, while, at the same time, water surface have shown a marked decrease. At the same time, seasonal phenology of aquatic vegetation has been shown to determine sedimentation rates throughout the year. It is evident from these results that different management strategies, focused on each environmental predictor, should be applied for Mediterranean shallow lakes depending on the growth form of aquatic vegetation with which managers are handling.

REFERENCES

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