

Experimental study of the effect of salinity on the composition and richness of plant communities in temporary ponds in Western Morocco

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Introduction

Temporary ponds are small aquatic ecosystems showing alternating dry and flooded phases. They are widely represented in the Mediterranean region, particularly in Morocco, where they host remarkable flora and fauna of high conservation value. They play important roles in the landscape, such as flood control, groundwater recharge, toxic substance removal and nutrient recycling. However, these ecosystems are among the most threatened by human pressures and climate change. Water pumping, agricultural intensification, massive clearing of vegetation and climate aridification can induce their destruction or their degradation by alteration of their hydrological functioning and causing eutrophication and salinization. The effects of salinization on plant communities, however, remain poorly understood.

The aim of this work was to study (1) the effects of salinity on the richness, abundance and composition of the plant community of temporary ponds, (2) the degree of tolerance of plants to salt stress.



Some examples of uses of temporary ponds

Some threats to temporary ponds in Benslimane

Materials and methods

A greenhouse experiment was carried out with the soil of 6 temporary ponds (3 in Cork oak forest and 3 in agricultural areas) in the province of Benslimane (north-western Morocco) to study the effect of salinity on species richness and abundance in plant communities. In each pond, soil samples containing the seed stock were collected along two orthogonal transects. After homogenizing soil samples for each individual study pond, the samples were divided into 56 microcosms and exposed to different salinity treatments (Control, 1g, 2g, and 5 g/L). Species were identified and their abundance measured every three weeks for a total of 5 months, covering most of their growth and development stages of their life cycle.

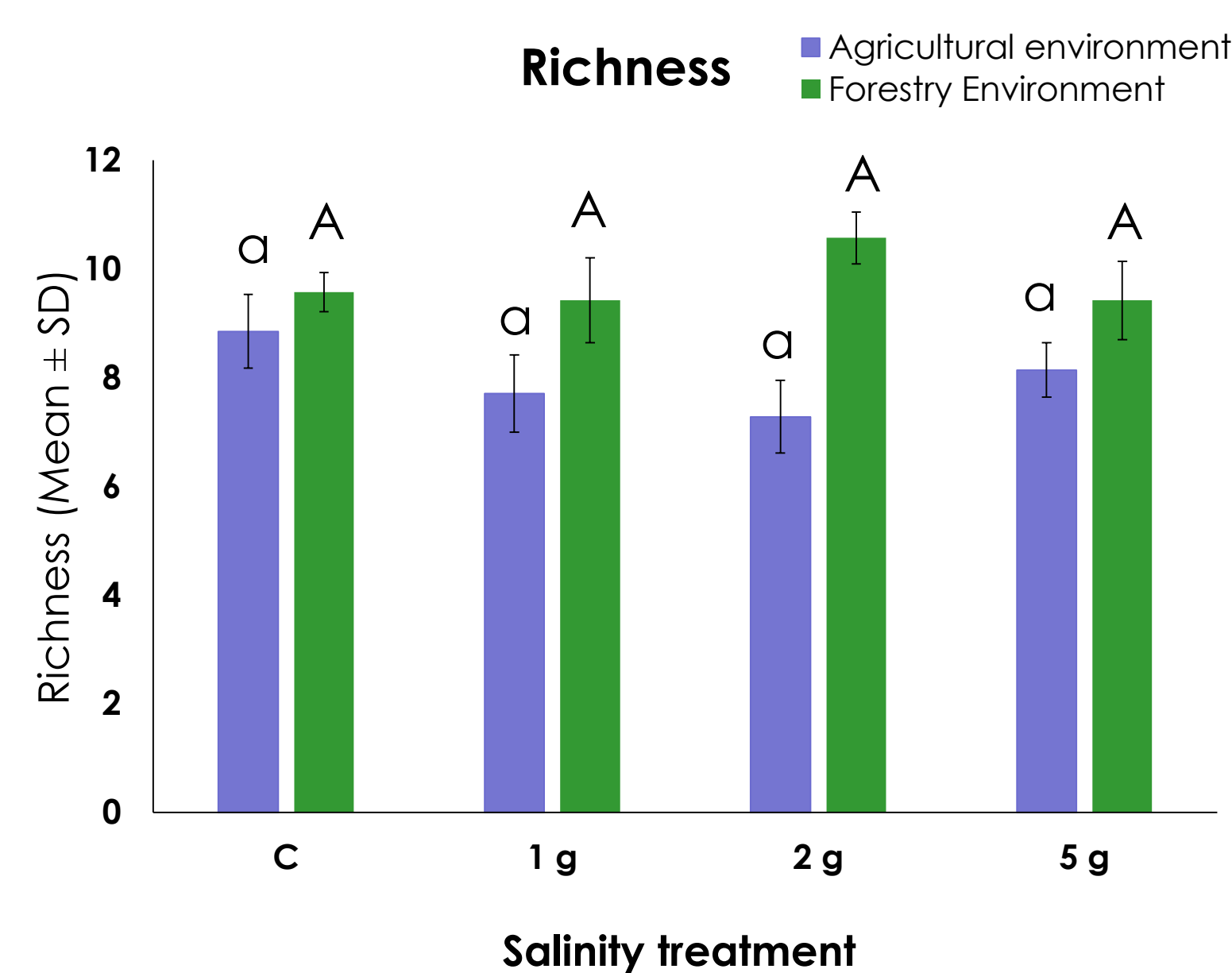


Fig. 2 : Variation of richness with salinity treatment in Agricultural and Forest area

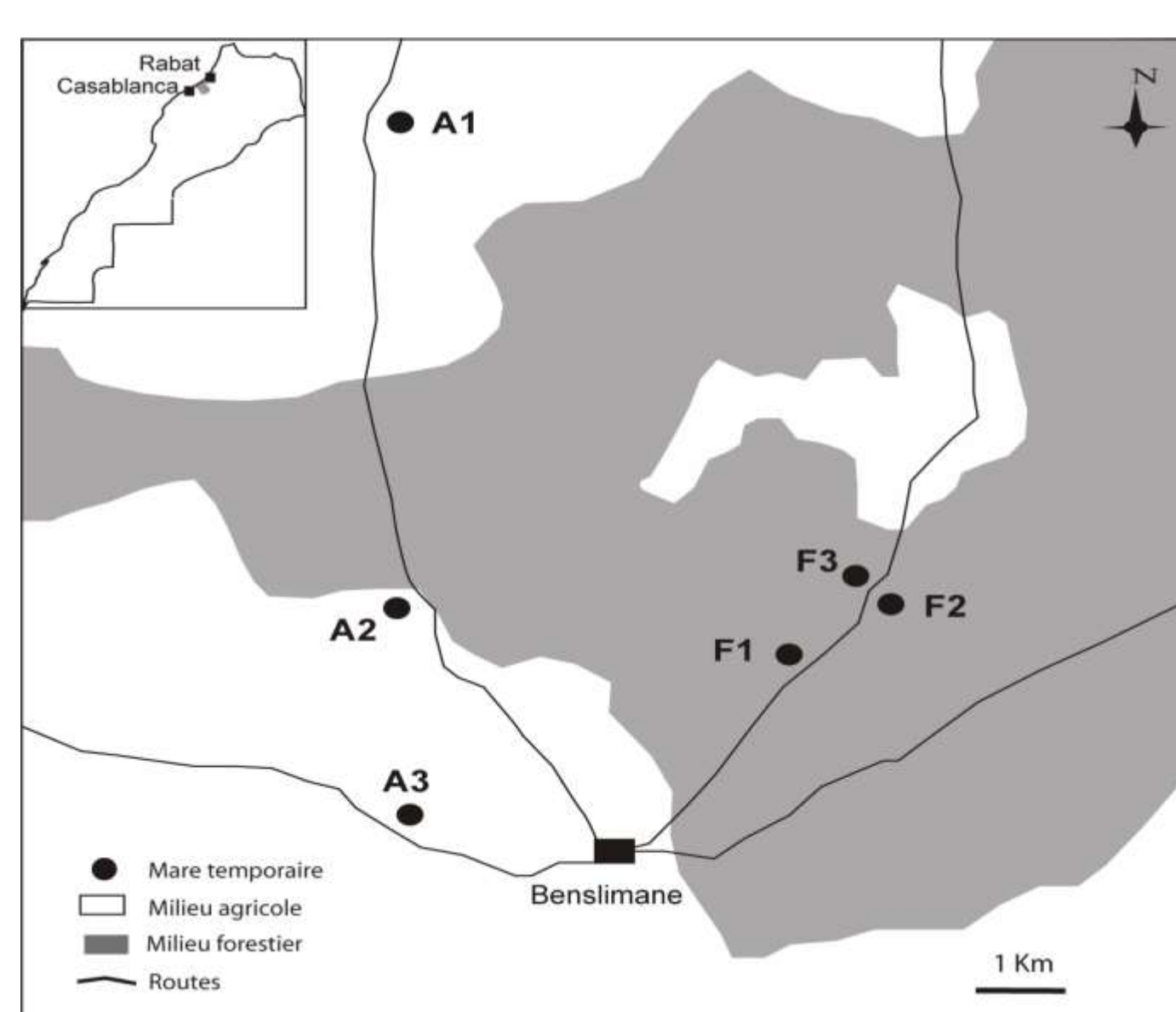


Fig. 1: Location of the 6 temporary ponds used in this study to collect the soil samples containing the seed stock

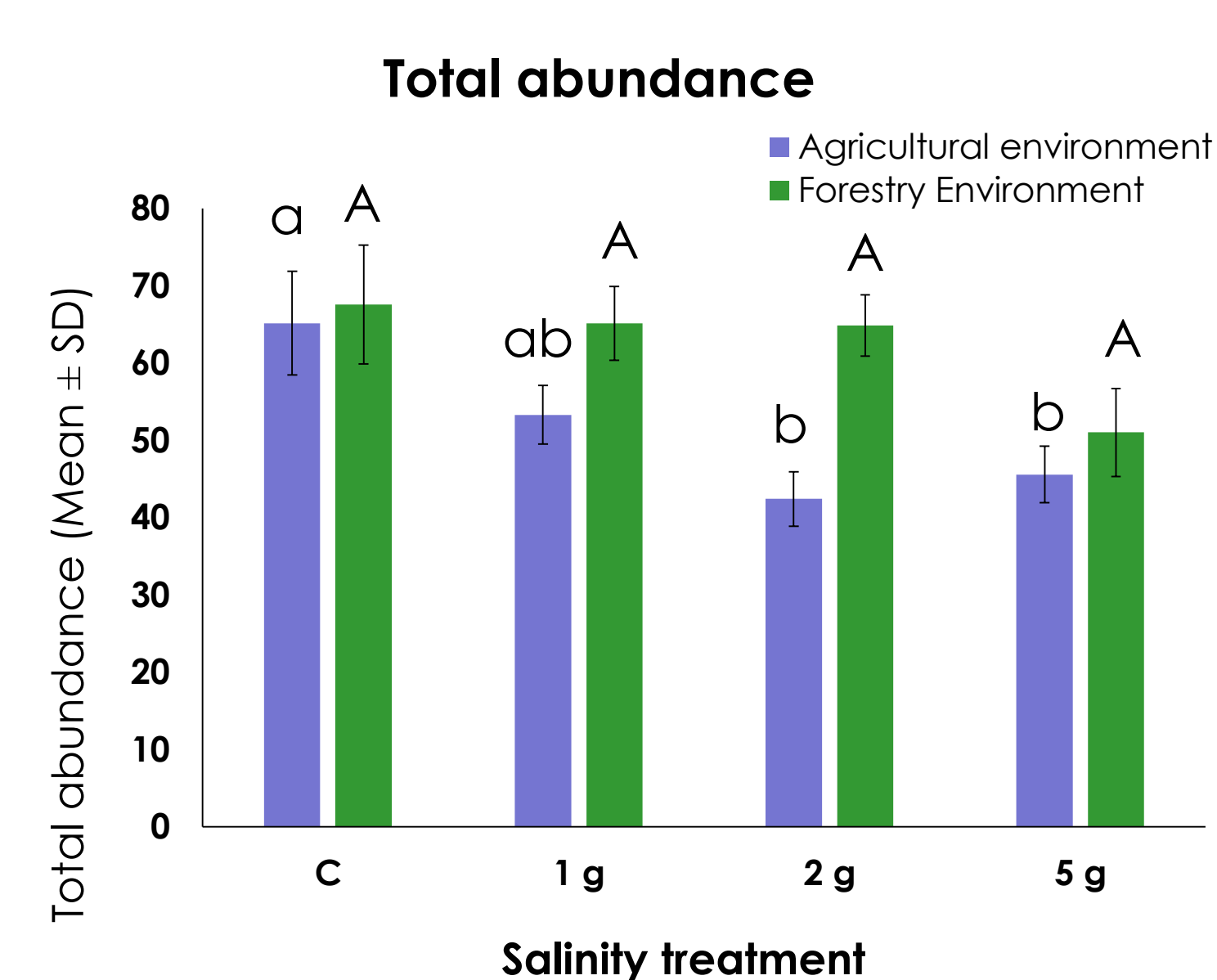


Fig. 3: Variation of total abundance with salinity treatment in Agricultural and Forest area

Results and discussion

The results show that salinity does not affect total species richness of plant communities in temporary ponds, but it significantly decreases their total abundances, acting as a critical environmental filter at concentration of 5g/L. Two major groups of species were distinguished in our experiments based on their salt stress vulnerability, i.e., salt-sensitive species (*Nitella opaca*, *Isoetes velata*, *Eryngium atlanticum*, *Lemna minor*) and salt-tolerant species (*Chara vulgaris*, *Damasonium bourgaei*, *Lythrum tribracteatum*, *Pulicaria arabica*).

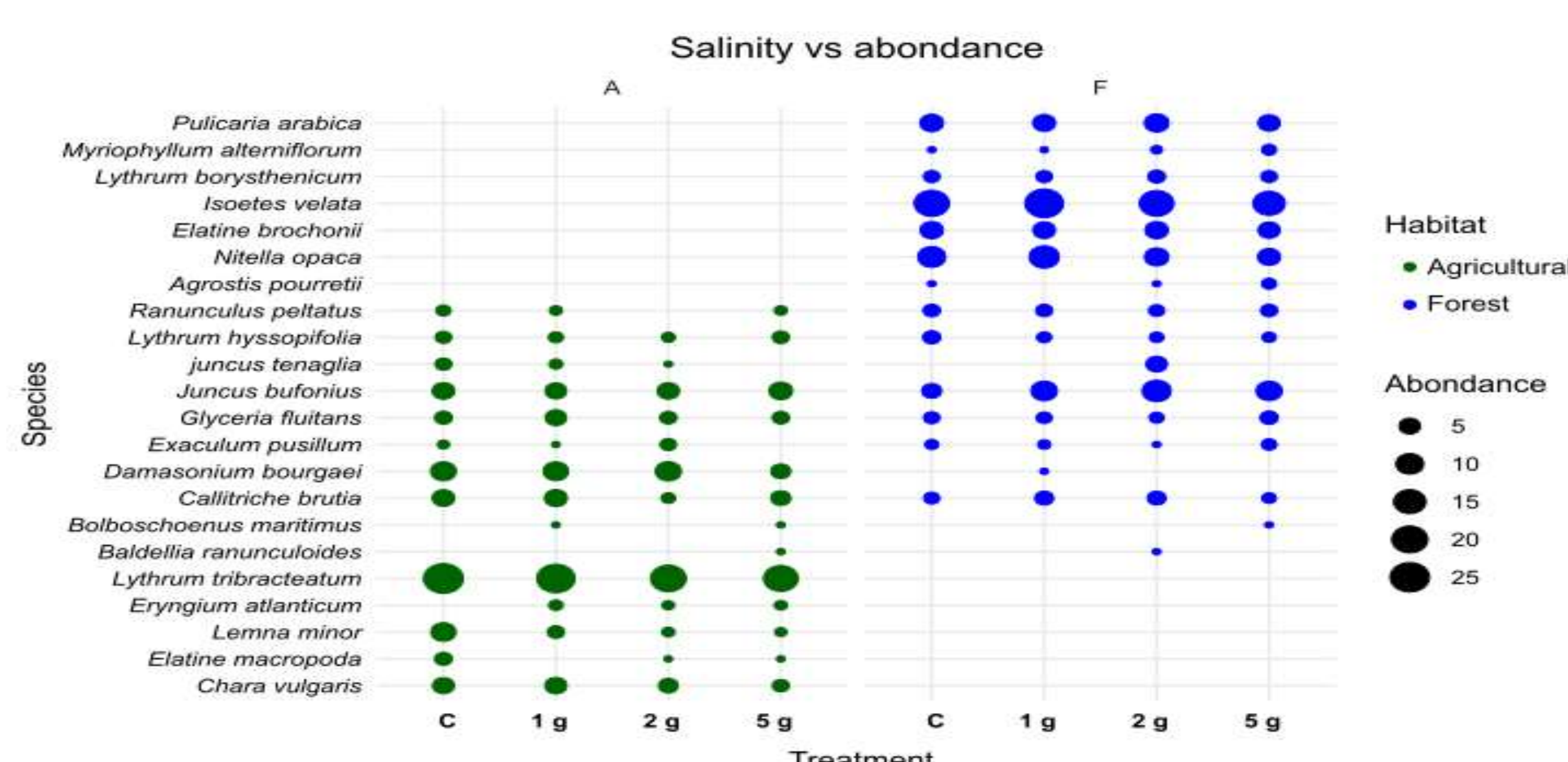
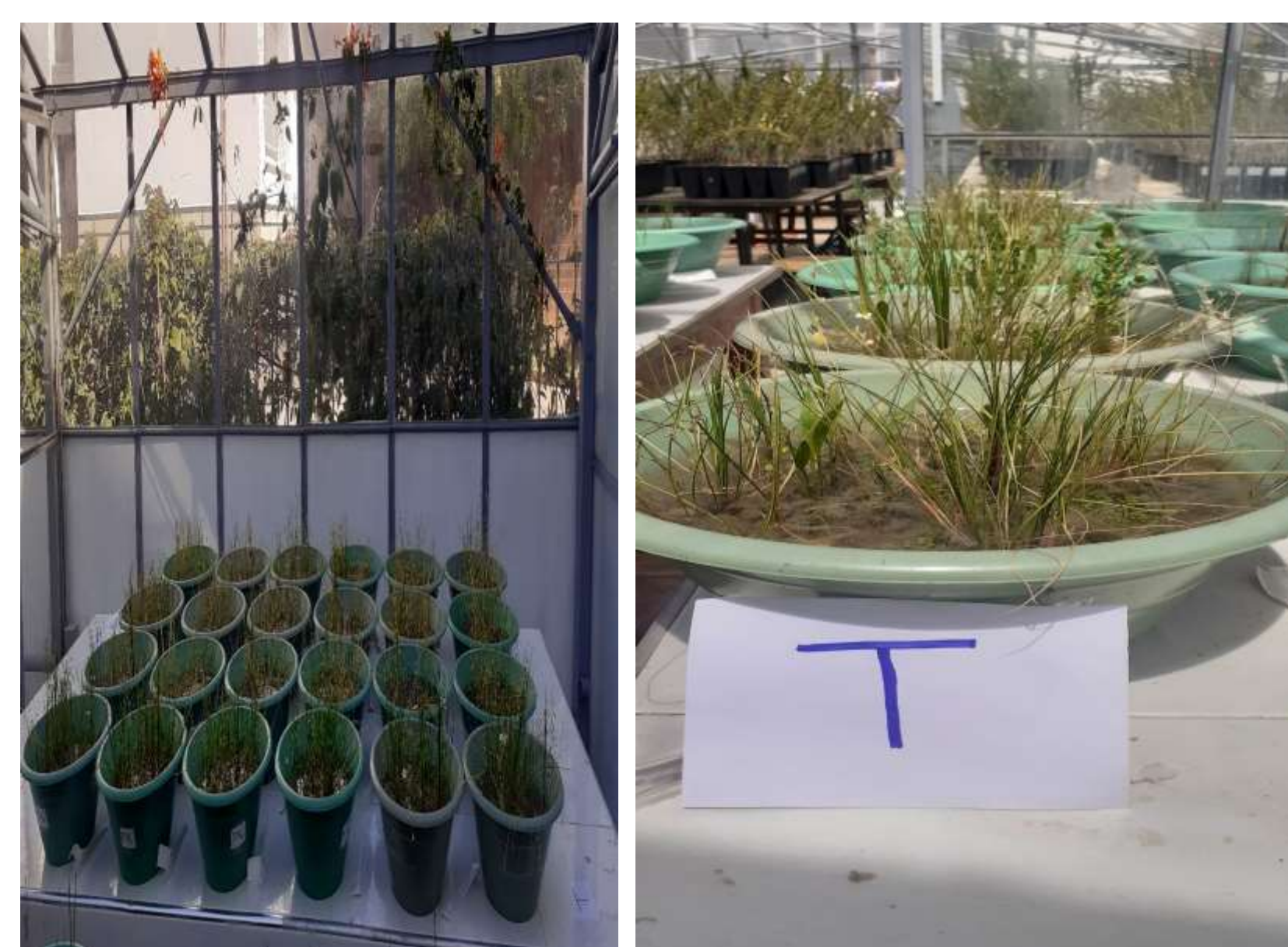


Fig 4. Total abundance of each species in the salinity classes in agricultural and forest ponds



CONCLUSION

The decrease in species abundance with increasing salinity stress may cause a collapse of the seed stock that can lead to the impairment of wider biodiversity of temporary ponds in the future.

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