# *Acacia longifolia* invasion in Portuguese and Brazilian ecosystems: environment features and biological traits

Jorge Luis P. Oliveira-Costa[1]
Rui Ferreira de Figueiredo[2]
Vânia Regina Pivello[3]

Environmental history and structure are key drivers in biological invasion, and widely used on invasion management. Environmental modifications lead to changes in the biological invasion patterns, with consequences for ecosystem functions. As impacts from biological invasions increase, one of the most urgent tasks is to identify areas of high vulnerability. The lack of information on the impacts of biological invasions is a problem especially on coastal systems, where most of the recorded disturbances associated with invasive species have occurred.
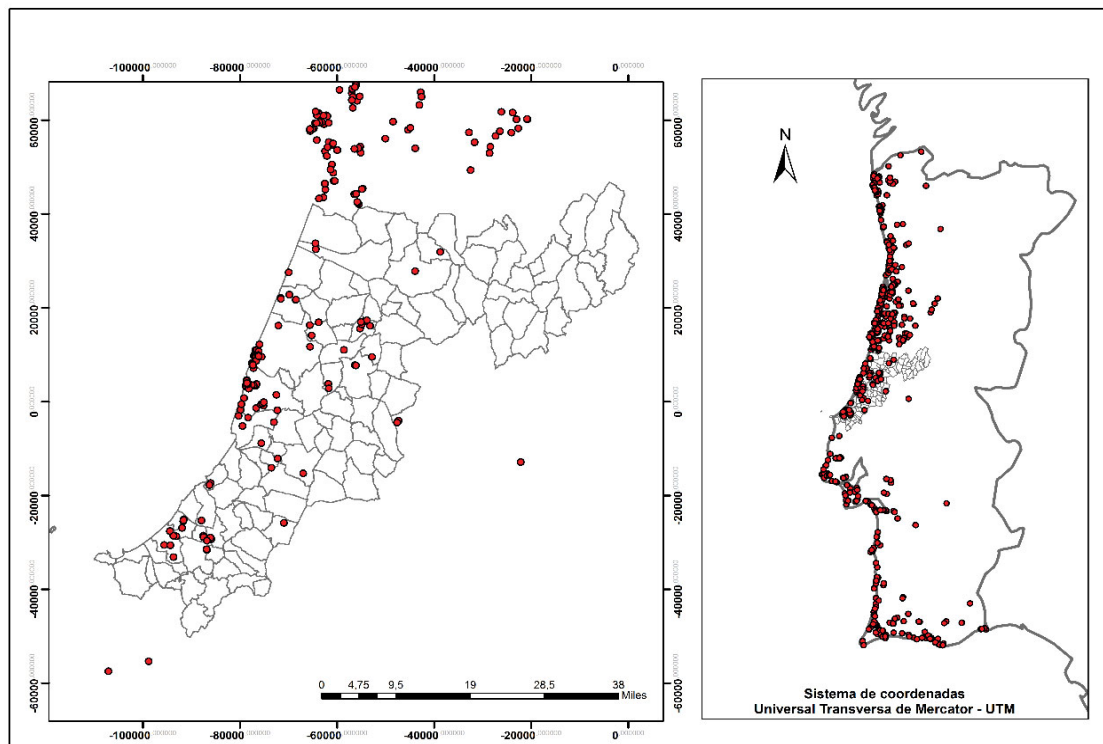
1 Doutorando em Geografia Física. Un. Coimbra. Portugal. Centro de Estudos de Geografia e Ordenamento do Território. Un. Coimbra. MSc em Geografia Física. E-mail: oliveiracostajorge@gmail.com
2 Departamento de Geografia e Turismo. Un. Coimbra. Portugal. Centro de Estudos de Geografia e Ordenamento do Território. Un. Coimbra. PhD em Geografia. E-mail: ruiff@ci.uc.pt
3 Instituto de Biociências. Un. São Paulo. Brasil. Departamento de Ecologia Geral. Un. São Paulo. PhD em Applied Ecology. E-mail: vrpivel@ib.usp.br

We provide here a regional analysis, describing spatial patterns of *Acacia longifolia* invasion in the coastal systems of both Portugal and Brazil. We also document temporal changes and investigate the factors underlying these patterns.
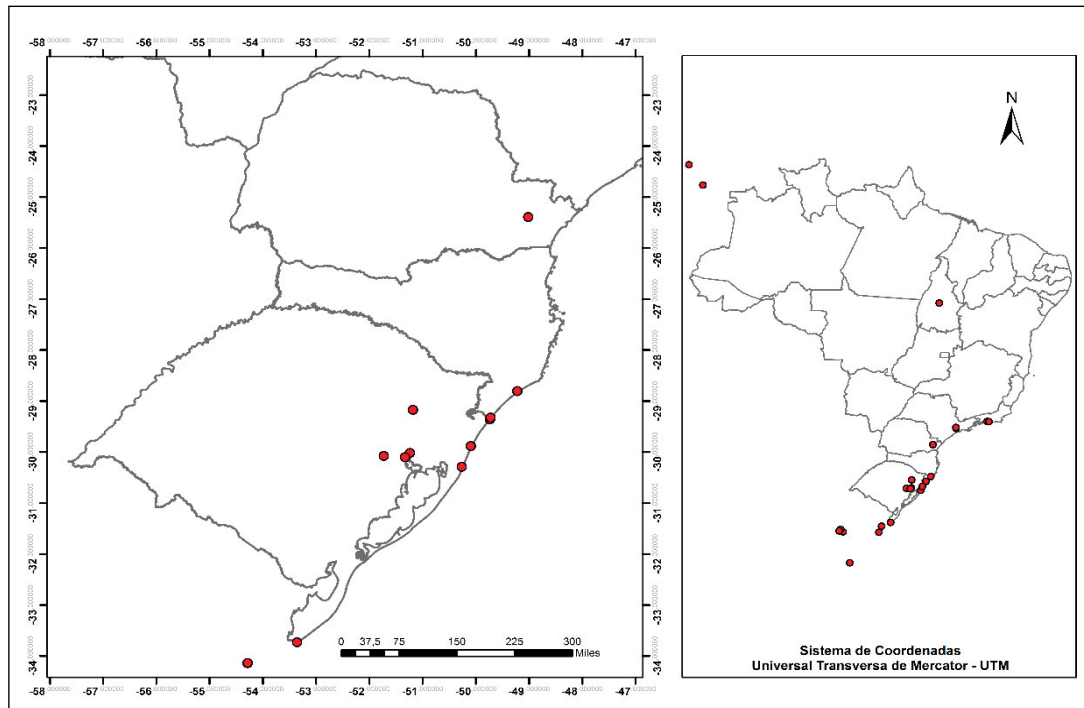
Using spatial analysis and modelling, aerial imagery and environmental data from 1960 to 2022, we identify in Portugal and Brazil the areas most invaded by *Acacia longifolia*. We classify these areas into regions and sub-regions according to their profiles facing six environmental predictors: soil, topography, land-use, rainfall, fire, and wind. These invaded areas are mainly concentrated in the Leiria District (Central Portugal) and Santa Catarina and Rio Grande do Sul States (South Brazil).

Using the environmental predictors we modeled drivers of variation in the six environmental characters, in order to estimate the vectors of propagation for *A. longifolia* species, total area invaded, and the rate of change in the density of *Acacia* populations between 1960 and 2022.

A preliminary approach has revealed that environmental features in Portugal are systematically related to *A. longifolia* invasion in these ecosystems and its current spatial distribution. These correlations have provided new informations for modeling the invasion scenarios, which will help to implement effective eradication strategies to Portuguese ecosystems.

In Leiria district (Central Portugal) we observed a spatial gradient in the process of invasion from coast to inland, with a more dense propagation of *A. longifolia* in the coastal. This spatial variation seems to be related with several environmental characteristics. For example, fire tends to act as a generic short-term factor in reducing invasion size and intensity; rainfall,

topography, wind and land-use changes tends to be related with variations in shrub biomass and individuals loads, and therefore, exert greater control in the direction of the invasion.
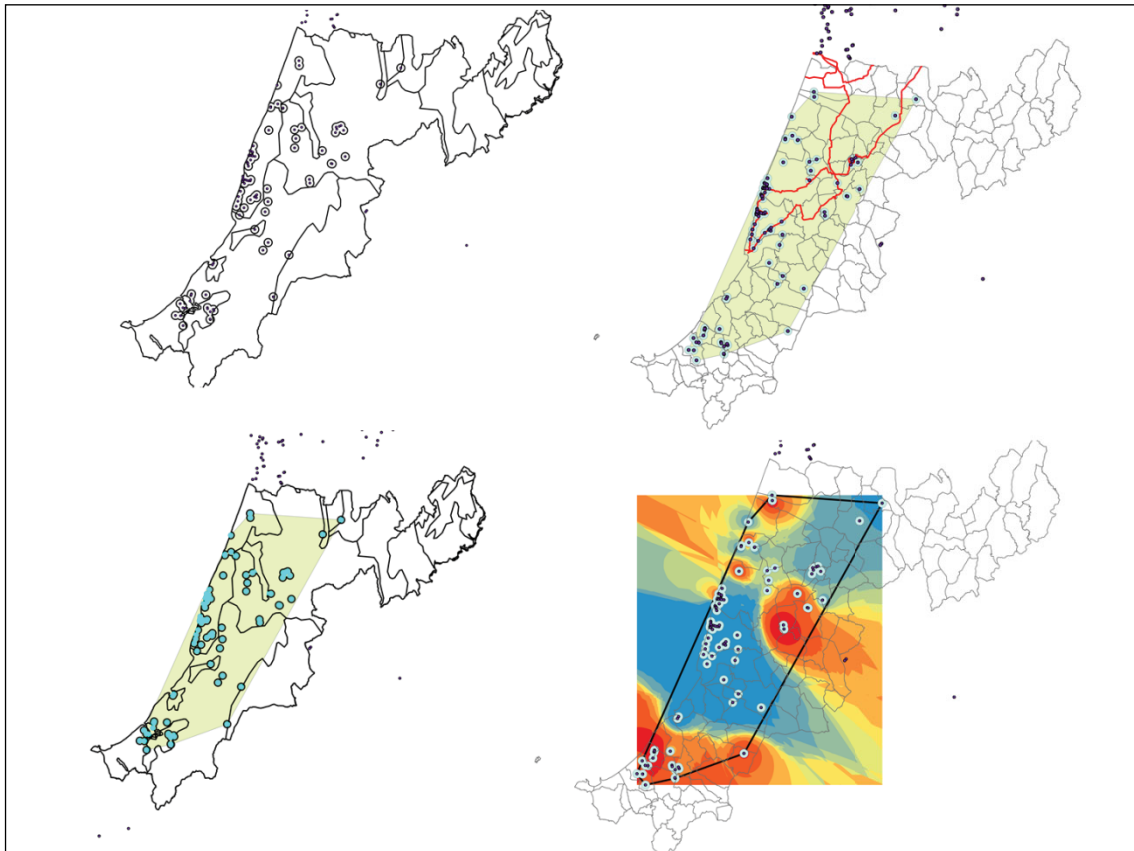
The results suggest that increasing environmental modifications are driving forces for invasion spread. The spatial and temporal patterns are part of a general increase in total area invaded by *Acacia longifolia*, especially in temperate regions where the "health" of the coastal environment may have been already compromised. These results, combined with further global and regional information can contribute to the design of strategies to deal with *Acacia longifolia* invasions.

PRELIMINARY DATA ACACIA ECOLOGY ON BRAZILIAN DUNE SYSTEMS (FLORIANOPOLIS)

SAND Average: 85%		ORGANIC MATTER Average: 2%		DENSITY Average: 1,5g/ml	
86,6		2,9		1,5	
85,3		3,9		1,5	
86,2		1,9		1,4	

FINE PARTICLES Average: 10%		pH Average: 5,5%		SOIL CAPACITY (72 hours time analysis) Average: 25-30%	
10,4		5,9		31	
10,8		4,2		25	
11,5		4,8		25	

D. Viscosa N2-Fixing Measure: mg/g		*A. longifolia* N2 Fixing Measure: mg/g		*A. podalyriifolia* N2-Fixing Measure: mg/g	
22,9		30,5		27,0	
22,7		25,7		29,7	
20,8		22,5		26,2	

1. Rio Vermelho Park (I)   2. Rio Vermelho Park (II)   3. Lagoa da Conceição Park