

Invasion of *Scaevola sericea* (Goodeniaceae) in Cuba: Invasive Dynamic and Density-Dependent Relationship with the Native Species *Tournefortia gnaphalodes* (Boraginaceae)

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Abstract : The invasion of *Scaevola sericea* Vahl (Goodeniaceae) in Cuba is a recent process, this exotic invasive species was reported for the first time, in the national territory, by 2008. *S. sericea* is native to the coasts around the Indian Ocean and western Pacific, common on sandy beaches; it has expanded rapidly around the planet by either natural or anthropic causes, mainly due to its use in hotel gardening. Cuba is highly vulnerable to the colonization of these species, mainly due to tropical hurricanes which have increased in the last decades; it also affects other native species such as *Tournefortia gnaphalodes* (L.) R. Br. (Boraginaceae) that show invasive manifestations because of the unbalanced state of demographic processes of littoral vegetation, which has been studied by authors during the last 10 years. The fast development of Cuban tourism has encouraged the use of exotic species in gardening that invade large sectors of sandy coasts. Taking into account the importance of assessing the impacts dimensions and adopting effective control measures, a monitoring program for the invasion of *S. sericea* in Cuba was undertaken. The program has been implemented since 2013 and the main objective was to identify invasive patterns and interactions with other native species of coastal vegetation. This experience also aimed to validate the design and propose a standardized monitoring protocol to be applied throughout the country. In the Cuban territory, 12 sites were chosen, where there were established 24 permanent plots of 100 m²; measurements were taken twice a year taking into consideration variables such as abundance, plant height, soil cover, flora and companion vegetation, density and frequency; other physical variables of the beaches were also measured. Similarly, for associated individuals of *T. gnaphalodes*, the same variables were measured. The results of these first four years allowed us to document patterns of *S. sericea* invasion, highlighting the use of adventitious roots to enhance their colonization, and to characterize demographic indicators, ecosystem affections, and interactions with native plants. A density-dependent relationship with *T. gnaphalodes* was documented, finding a controlling effect on *S. sericea*, so that a manipulation experiment was applied to evaluate possible management actions to be incorporated in the Plans of the protected areas involved. With these results, it was concluded, for the evaluated sites, that *S. sericea* has had an invasion dynamics ruled by effects of coastal dynamics, more intense in beaches with affectations to the native vegetation, and more controlled in beaches with more preserved vegetation. It was found that when *S. sericea* is established, the mechanism that most reinforces its invasion is the use of adventitious roots, used to expand the patches and colonize beach sectors. It was also found that when the density of *T. gnaphalodes* increases, it detains the expansion of *S. sericea* and reduces its colonization possibilities, behaving as a natural controller of its biological invasion. The results include a proposal of a new Monitoring Protocol for *Scaevola sericea* in Cuba, with the possibility of extending its implementation to other countries in the region.

Keywords : biological invasion, exotic invasive species, plant interactions, *Scaevola sericea*

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