

NE Atlantic islands susceptibility to MNIS

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It is largely known that introduced species not only are a cause by itself of biodiversity loss but also they interact with biodiversity as modifying factors for habitat destruction, pollution and climate change, compromising the integrity of marine ecosystems (Rilov & Crooks, 2009). However, our understanding of the current status of marine introductions is still very limited in most regions of the world (Campbell *et al.*, 2007). The problem of jeopardize natural marine biodiversity is especially serious on islands, as millions of years of physical isolation has favored the evolution of unique species and ecosystems. Moreover, the evolutionary processes associated with isolation have also resulted in island species being especially vulnerable to competitors, predators, pathogens and parasites from other areas (Vitousek, 1990).

Exhaustive reviews on macroalgae introductions have been published especially for the Mediterranean Sea but also for the Atlantic (e.g. Wallentinus, 2002; Minchin, 2007) and other seas. Nevertheless, to the authors' knowledge, there are no studies focused on non-indigenous macroalgae in Atlantic oceanic islands. The emphasis of the present work is in the Azores islands, since this archipelago represents an important geographical link between the NE Atlantic and NW Atlantic coasts.

Although the Azores archipelago, comprising nine islands, is strongly-isolated from other lands (about 800 km from Madeira archipelago, 1,500 km from western coast of Europe and 1,900 km from eastern coast of America) over 7% of its macroalgae are considered non-indigenous species in contrast to the 2.8% introduced macroalgae at a global scale (following Williams & Smith, 2007 and Guiry, 2012). As it is reported for mainland coastal regions, maritime transport encompassing ballast water and vessel fouling seems to be the most likely vector of macroalgae introduction in the Azores archipelago. At least 80% of the non-indigenous macroalgae seems to have found suitable condition to establish in Azores as they have spread to at least another island, and from these, 28% have a potential invasive status in at least one location in the world.

While eradication of macroalgae has proven to be feasible in some small islands (McNeely, 2004), evidence from *Caulerpa webbiana* in Faial Island in the Azores suggests that non-indigenous macroalgae can have negative economic impacts and be incredibly difficult and costly to eradicate or even to control.

Considering the number of algae species currently recorded as non-indigenous, the vulnerability of the biodiversity of the islands in face of newcomers and the difficulties to control and eradicate them, efforts to prevent new introductions must be urgently addressed in the Azores Islands.

References

Campbell M.L. Gould B. and Hewitt C.L. 2007. Survey evaluations to assess marine bioinvasions. *Marine Pollution Bulletin* 55: 360-378.

Guiry M.D. 2012. How many species of algae are there? *Journal of Phycology* 48: 1057-1063.

Minchin D. 2007. A checklist of alien and cryptogenic aquatic species in Ireland *Aquatic Invasions* 2(4): 341–366.

Rilov G. and Crooks J.A. 2009. *Biological Invasions in Marine Ecosystems – Ecological, Management, and Geographic Perspectives*. Springer-Verlag, Berlin. 641 pp.

Vitousek PM 1990. Biological invasions and ecosystem process—towards an integration of population biology and ecosystem studies. *Oikos* 57:7–13.

Wallentinus I. 2002. Introduced marine algae and vascular plants in European aquatic environments. In: (E. Leppäkoski, S. Gollasch and S. Olenin, eds) *Invasive aquatic species of Europe. Distribution, impacts and management*. Kluwer Academic Publishers, Dordrecht. pp. 27–52.

Williams S.L. & Smith J.E. 2007. A global review of the distribution, taxonomy, and impacts of introduced seaweeds. *Annual Review of Ecology and Systematics* 38: 327–359.