

Sometimes they come back: the re-colonization of the alien seagrass *Halophila stipulacea* (Forsskål) Ascherson, 1867 (Hydrocharitaceae) in the Palinuro Harbor (Tyrrhenian Sea, Italy)

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Abstract

We report the return of the alien seagrass *Halophila stipulacea* (Forsskål) Ascherson, 1867 (Hydrocharitaceae) in the harbor of Palinuro (Salerno, Tyrrhenian Sea, Italy), six years after the local extinction of this species in this area in 2011. The record of this new colonization event of *H. stipulacea* in Palinuro represents the northernmost location of this tropical alien seagrass in the Western Mediterranean. The species, when first studied in June 2007, had a bottom cover of 16 m², which was reduced to 4 m² in 2009, and to 2 m² in 2010. In 2011, the species was no longer detectable and was considered extinct in the area. In September 2017, the species was recorded again in the area in a few zones, close to where it was originally observed, and covering approx. 5.5 m². Seven patches were monitored, occurring between 1.5 and 4 m depth, and with a mean shoot density of 6,300 shoots/m², mean leaf length of 33.8 mm, and mean width of 5.3 m, while flowers were absent. Evidence of strong grazing (bite-marks) was observed on 57% of the *H. stipulacea* leaves by native fish species.

Key words: seagrasses, introduced species, geo-referenced distribution, phenology, grazing, Mediterranean Sea

Introduction

The alien seagrass *Halophila stipulacea* (Forsskål) Ascherson, 1867 (Hydrocharitaceae) is a Red Sea immigrant species that has been recorded in the Mediterranean since 1895 and in Italian waters since 1988 (Biliotti and Abdelaad 1990; Gambi et al. 2009). The species was apparently restricted to the Eastern Mediterranean Sea for several decades (Lipkin 1975; Van der Velde and Den Hartog 1992), where it was reported up to the Albania coast (Valona Gulf, Kashta and Pizzuto 1995), but subsequently showed a progressive and relatively rapid colonization of western areas through Malta, on the Ionian coast of Sicily (Biliotti and Abdelahad 1990; Alongi et al. 1992), and Tunisia (Sghaier et al. 2011). More recently, *H. stipulacea* was also introduced into the Caribbean

Sea (Ruiz and Ballantine 2004) where it is progressively spreading (Willette and Ambrose 2009; Smulders et al. 2017).

In the western basin of the Mediterranean Sea, *Halophila stipulacea* was first observed in 1995 at Vulcano Island in the Aeolian Archipelago (Southern Tyrrhenian Sea) (Acunto et al. 1997; Procaccini et al. 1999). For more than 10 years, the species was not reported north of Vulcano Island, but was found in 2006 in the harbor of Palinuro (Salerno, Tyrrhenian Sea), approx. 180 km north of Vulcano Island, which represents the northernmost occurrence of the species in the Tyrrhenian Sea and Western Mediterranean (Gambi et al. 2009). In June 2007, several patches *H. stipulacea* in Palinuro were found from 1 to 5 m depth, covering an area of approximately 16 m² (Gambi et al. 2009). Since then, there was a progressive