

## NOW YOU SEE IT, NOW YOU DON'T: PRESENCE OF *CAULERPA RACEMOSA* VAR. *CYLINDRACEA* (CHLOROPHYTA, CAULERPALES) IN THE MALTESE ISLANDS

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### Abstract

*Caulerpa racemosa* var. *cylindracea*, an invasive alga present in the Mediterranean Sea, was first recorded from the Maltese Islands in 1997. Between then and the mid-2000s, the alga spread rapidly and became abundant at most coastal sites around the islands. However, its spatial distribution and abundance decreased rapidly after 2006, such that the alga has become rare to encounter locally. The present work, which formed part of a broader study to assess the influence of *C. racemosa* on hard bottom infralittoral habitats, confirms a large decline in the distribution and abundance of this species in recent years in Maltese coastal waters.

**Keywords:** *Alien species, Algae, Biogeography, Sicily Channel*

### Introduction

*Caulerpa racemosa* was first reported from the Maltese Islands in 1997 [1]. Since then, the species spread rapidly, such that it became ubiquitous and abundant around the Maltese Islands [2]. A study by Camilleri undertaken in 2005 [3] concluded that nutrient enrichment promoted an increased abundance of *C. racemosa* in Maltese coastal areas. The main objective of the present study was to gather data on the distribution and abundance of *C. racemosa* around the Maltese Islands, given that preliminary observations indicated a local decline of the species during the past six years.

### Methods

Surveys using snorkeling and SCUBA diving were undertaken during summer 2009 at 11 sites located on the northeastern coast of Malta. All study sites had similar exposure and coastal geomorphological characteristics, and were located within the 2 m – 5 m depth range. Estimates of the abundance of *C. racemosa* were carried out at each site by recording the percent cover of the alga in each of three replicate 20 cm x 20 cm quadrats. From three of the sites where *C. racemosa* had a percentage cover greater than 10%, St. Paul's Bay, Salina Bay and Zonqor Point, the algae enclosed within the quadrat were scraped off using a small trowel and transferred to a mesh bag. In the laboratory, the algae from each replicate quadrat were separated according to species and then dried separately at 80°C for 24 hours to obtain estimates of dry weight per quadrat for each alga, including for *C. racemosa*.

### Results & Discussion

Of the 11 sites surveyed, 5 did not support any *C. racemosa*, 3 had very sparse growth, and the remaining 3 supported a mean percentage cover of 38.33% - 65% (Tab. 1), although values of percentage biomass obtained from the latter sites were rather low (Tab. 1). Furthermore, the latter 3 sites, where *C. racemosa* had the highest percentage cover and biomass, happen to be characterized by relatively (i.e. compared to the other study sites) poor water quality and elevated nutrient levels. The findings contrast with those of previous studies; for example, in the present study *C. racemosa* was completely absent from St. Thomas Bay and Marsaxlokk, which are known previously to have supported extensive meadows of the alga [2]. Although it is difficult to identify with certainty the factor/s that have led to the observed decline of *C. racemosa* around the Maltese Islands, a possible reason may be decreased nutrient levels in coastal waters, which resulted from nationwide efforts and measures adopted in recent years to improve coastal water quality [4]. *C. racemosa* is a highly opportunistic species and generally invades habitats that are disturbed and degraded, including areas characterized by poor water quality and elevated nutrient levels. Improved water quality seems to have contributed to the decline of the invasive alga and/or increased vitality of native algal species, which have regained their original abundance.

### Conclusions

The results of the present work support the hypothesis that the distribution and abundance of *C. racemosa* have declined around the Maltese Islands in recent years, and that this may have resulted from decreased nutrient levels in coastal waters, and the re-establishment of native algae in its stead.

Tab. 1. Estimates of percentage cover and biomass ( $\pm$  SD) of *C. racemosa* recorded from the 11 study sites.

Sites	Mean % cover of <i>C. racemosa</i>	Mean % dry weight (g) of <i>C. racemosa</i>
White Tower Bay	Absent	-
Armier Bay	Absent	-
St. Paul's Bay	61.6 $\pm$ 2.89	24.19 $\pm$ 1.89
Salina Bay	38.33 $\pm$ 2.89	13.25 $\pm$ 2.72
Bahar ic-Caghaq	7.67 $\pm$ 2.52	-
St. George's Bay	6.67 $\pm$ 2.89	-
Spinola Bay (St. Julians)	1.67 $\pm$ 2.89	-
Sliema Bay	Absent	-
Zonqor Point (Marsaskala)	65.00 $\pm$ 5.00	20.93 $\pm$ 0.89
St. Thomas Bay	Absent	-
Marsaxlokk	Absent	-

### References

- 1 - Borg, J. A., Micallef, S. A., Pirota, K., and Schembri, P. J. (1997). Report on a survey of the marine infralittoral habitats and benthic assemblages in the Qawra/Dwejra area (Gozo). Stage I. Msida, Malta: Malta University Services Ltd, 70pp.
- 2 - Mifsud, C. & Lanfranco, E. (2007). *Caulerpa racemosa* (Chlorophyta, Caulerpales) in the Maltes Islands (Central Mediterranean). Proceedings of the 3rd Mediterranean symposium on marine vegetation (Marseilles, 27 – 29 March, 2007)
- 3 - Camilleri, C. (2005). *Caulerpa racemosa* impact on phytobenthic / macroalgal communities at Tad-Debra (Marsaxlokk). Department of Biology, University of Malta.
- 4 - Malta Environment & Planning Authority (2013). Water Framework Directive <http://www.mepa.org.mt/water>