

ERADICATION OF INVASIVE ALGA *CAULERPA RACEMOSA* VAR. *CYLINDRACEA* IN NATIONAL PARK MLJET (CROATIA)

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Abstract

In the summer of 2004 the invasive green alga *Caulerpa racemosa* var. *cylindracea* was found in N.P. Mljet in the area of Great Lake which is a unique marine ecosystem. Eradication was conducted with the aim to slow down the algae spread. Manual eradication methods were used such as covering with plastic foil or collecting by underwater suction pump. In two years period the area covered by algae was significantly reduced.

Keywords : *Adriatic Sea, Algae.*

Introduction

The invasive green alga *Caulerpa racemosa* var. *cylindracea* was observed in the Mediterranean Sea for the first time in 1991 in Libya. In a period of 20 years it expanded to almost all regions of the Mediterranean [1]. First record in the Adriatic Sea was in September 2000 in Croatia [2]. Predominantly spreading by current, till the end of 2006 there is more than 50 locations recorded [3, not published data]. In July 2004, the alga was found in Channel Soline in N.P. Mljet between 0.5 and 4 m deep, affecting around 150 m of coastline (Fig 1.). Channel Soline connects open water and two sea lakes which are a unique marine ecosystem. Additional colony of the alga was found just outside of the channel in Gonoturska cove. In September 2004 the alga was found in Grate Lake between 8 and 14 m deep, affecting around 150 m of coastline, just a few meters from the greatest Mediterranean colony of *Cladocora caespitosa* reef. To protect lakes and the reef of *Cladocora caespitosa*, eradication of the alga was conducted in channel Soline and in Grate Lake. Colony in Gonoturska cove has affected 600 m of coastline and developed from 1 till 30 m deep. Therefore it was too large for eradication.

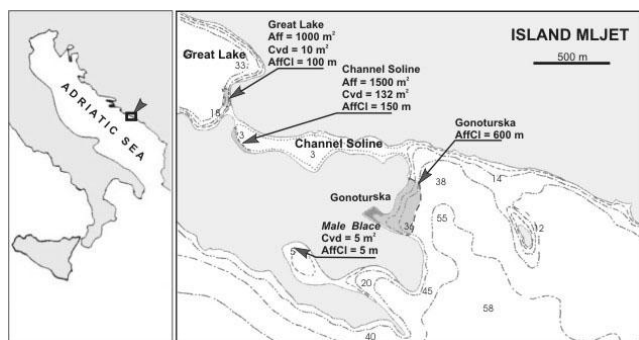


Fig. 1. Locations of *Caulerpa racemosa* var. *cylindracea* in National park Mljet. Data of covered area (Cvd), affected area (Aff) and affected coastline (AffCl) on the first observation.

Material and methods

Cartography of location Soline and Grate Lakes was made on 2.5 m wide transects. All detected colonies were eradicated by covering with black plastic foil, by sucking with underwater suction pumps or by manual collecting of small thalli. Plastic foils were left at the bottom for at least 6 months. Applied methods were developed during previous eradication of *Caulerpa taxifolia* [4]. Eradications were made in the beginning and near the end of the vegetative season of the alga (Tab. 1).

Results and discussion

Eradication of the *Caulerpa racemosa* var. *cylindracea* colonies was exceptionally difficult. Small fragments are usually invisible until stolon reaches length of 10 - 20 cm. Due to constant eradication efforts number of colonies and covered area was significantly reduced (Tab. 1). *Caulerpa racemosa* var. *cylindracea* is an exceptionally invasive species. Its eradication is difficult due to small fragments, successful reproduction and fast growing thalli.

Therefore it was decided by croatian scientists that eradication has to be done in the areas of high biological value but only if the colonies are small, as in the case of Great Lake. Eradication of the alga in Channel Soline and Great Lake can not be done in full due to extensive colony in Gonoturska Cove from where the new fragments or zygotes are carried into Channel Soline and Great Lake. If we allow the alga to spread easily, it would occupy Great Lake, the unique marine ecosystem and destroy the greatest Mediterranean *Cladocora caespitosa* reef. With eradication we can slow down its spreading and protect Great Lake ecosystem. In the mean time, scientist should find global method for algae control, e.g. biological control.

Tab. 1. History of the *Caulerpa racemosa* var. *cylindracea* colonies in eradicated locations Channel Soline and Great Lake.

Location	Channel Soline		Great Lake	
	nr. of colonies	coverage (m ²)	nr. of colonies	coverage (m ²)
July 2004	5	132	-	-
Sept 2004	-	-	3	10
Dec 2004	2	2	32	34
June 2005	17	25.5	2	1
Sept 2005	11	14	18	10.5
Dec 2005	9	9	24	15
July 2006	7	7	2	3

References

- 1 - Verlaque M., Afonso-Carrillo J., Gil-Rodríguez M. C., Durand C., Boudouresque C.-F. and Le Parco Y., 2004. Blitzkrieg in a marine invasion: *Caulerpa racemosa* var. *cylindracea* (Bryopsidales, Chlorophyta) reaches the Canary Islands (North-East Atlantic). *Biol. Inv.*, 6: 269-281.
- 2 - Žuljević A., Antolić B. and Onofri V., 2003. First record of *Caulerpa racemosa* (Caulerpales: Chlorophyta) in the Adriatic Sea. *J. M. B. A.* 83: 711-712.
- 3 - Žuljević A. and Antolić B., 2004. The spread of the invasive variety of *Caulerpa racemosa* in the Adriatic Sea. *Rapp. Comm. Int. Mer Médit.*: 466.
- 4 - Žuljević A. and Antolić B., 2002. Appearance and eradication of *Caulerpa taxifolia* in Croatia. In: Williams E. and E. Grosholz (eds.), International *Caulerpa taxifolia* - Conference Proceedings, San Diego, University of California, Department of Environmental Science and Policy, 1-10.