MONITORING OF BENTHIC HARMFUL ALGAL BLOOMS OF *OSTREOPSIS SP.* IN NAQOURA SOUTH OF LEBANON (EASTERN MEDITERRANEAN)

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Abstract

Within the framework of the ENPI-CBCMED program, project M3-HABs, funded by the European Union, a sampling campaign was established at the National Council for Scientific Research in Lebanon in order to monitor the development of Harmful Algal Blooms, in particular those of *Ostreopsis sp*. in Lebanese coastal waters. Planktonic water samples and benthic macroalgae samples were collected, with other parameters. In this present work, results obtained in Naqoura (South of Lebanon), from June 2014 to December 2015. will be shown. Air temperature ranged between 17.5°C and 36.3 °C, water temperature between 17.5°C and 31°C and salinity between 36.203 and 39.123. In both years, two yearly blooms were observed, with *Ostreopsis sp.* density reaching 228257 cell/g f in October 2014, and 264064 cell/g f in June 2015.

Keywords: Toxic blooms, Mediterranean Sea, Dinoflagellates

The occurrence of Harmful algal blooms (HABs) is a well-studied phenomena in the Mediterranean Sea (MS), due to its negative effects on economic sectors (aquaculture, fishing, and tourism), its environmental impact on aquatic ecosystems and risk to public health. In recent years, more attention has been accorded to the study of BHABs (Benthic Harmful Algal Blooms), due to increased occurrence of these events in recent years caused by species of genus Gambierdiscus, Prorocentrum and Ostreopsis (Fraga *et al*, 2012). In particular, Ostreopsis produces palytoxin-like metabolites, and has been linked to ecological impact and health problems, including skin irritations and respiratory difficulties (Lemée *et al.*, 2012). Its presence was first recorded in Western Mediterranean Sea in 1972 (Villefranche Bay, France) and in 1979 in Lebanese waters concerning the Eastern Basin (Abboud-Abi Saab, 1989). During the last decade, *Ostreopsis* species have been responsible of 3 important blooms in the Mediterranean Sea (Spain, Italy and Morocco), each time impacting more than 200 persons. In the aim of dealing with BHABs in the MS, with special reference to the genus *Ostreopsis*, a 2 year project the "M3-HABs" has been funded by the European Union within the framework of the ENPI-CBCMED program. The project partner from Lebanon was National Council for Scientific Research, National Center for Marine Sciences (NCMS), along with partners from France, Italy and Tunisia and other associated partners from Mediterranean countries. A preliminary sampling campaign was established at the NCMS starting June 2014. The objective was to monitor the development of harmful blooms of toxic benthic dinoflagellates along Lebanese coastal waters, with special emphasis on *Ostreopsis sp*. Five out of the initial 11 scanned sites, were chosen, covering the Lebanese Coast. Monthly sampling was conducted in all sites.

Fig. 1. Sampling sites of *Ostreopsis sp*. in Lebanese coastal waters

Ostreopsis sp. being an epiphytic species, both benthic (macroalgae) and planktonic (water) samples were collected at 50 cm and 30 cm depth respectively. Climatological (Air temp., wind speed and wind direction), Hydrological (Salinity, water temp), Biological (chlorophyll *a*) and Hydrobiological (nitrates, nitrites and orthophosphates) were also analyzed. Macroalgae was separated from the water, and *Ostreopsis sp*. cells were counted using a 1 ml Sedgwick-Rafter counting chamber. Ostreopsis concentrations were expressed as number of cells/g of fresh macroalgae (cell/g f) for benthic samples and cells/L for planktonic samples. Preliminary results of Ostreopsis sp. concentrations from June 2014 till December 2015 in benthic macroalgae samples in Naqoura (NAQ-8) at Southern borders of Lebanon will be presented. The site was chosen as it is considered a reference site unexposed to pollution.

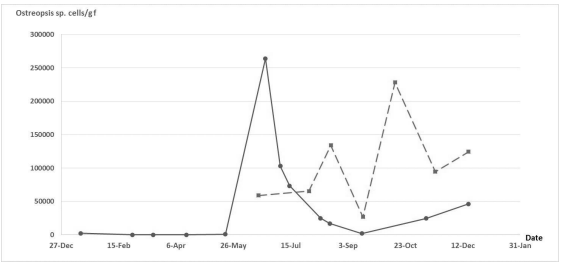

Fig. 2. Variation of benthic *Ostreopsis sp.* cell densities in NAQ-8 (cells/g f) in 2014 (dashed) and 2015 (line)

During this period, recorded air temperature varied between a min of 17.5°C (April 2015) and max of 36.3°C (May 2015). Recorded water temperature varied between a minimum (min) of 17.5°C (February 2015) and maximum (max) of 31°C (August 2015). Salinity varied between a min of 36.203 (January 2015) and a max of 39.123 (July 2014). In benthic macroalgae samples, *Ostreopsis sp*. was found year round in NAQ-8, except for February. This could be explained by the drop in sea water temperature (min 17.5°C), as *Ostreopsis sp.* is a thermophilic species. In 2014, the onset of the bloom occurred in the spring, thus preceding the start of the sampling campaign, with cell density of 59062 cell/g f in June, increasing gradually until the summer bloom reached its max cell density in August with 133864 cell/g f. The summer bloom was followed by a drop in cell densities in September, and a major autumn bloom in October with a max cell density of 228257 cell/g f. In 2015, the summer bloom occurred earlier compared to 2014, with max cell density reaching its highest of both years, of 264064 cell/g f in the June. It was also followed by a drop in cell densities in October, and a minor autumn bloom with a max of 46275 cells/g f in December

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