EFFECT OF DREDGED MATERIAL DUMPING INTO LOCAL (PICO-) PHYTOPLANKTON GROUPS OF NE MEDITERRANEAN

Leona Julia Schulze [1]*, Süleyman Tugrul [1] and Zahit Uysal [1]
[1] METÜ-Institute of Marine Sciences - leona@ims.metu.edu.tr

Abstract
Dumping of dredged materials from coastal zone into the sea is a common threat to existing marine ecosystems. Less contaminated sediments from Samandag harbor and more polluted sediments from Mersin harbor were added in different amounts into coastal and off-shore plankton communities of NE Mediterranean. Chlorophyll developments show a stronger increase of biomass in the Mersin sediment added microcosms. The results indicate that long-term dumping activities may lead to result in biomass enhancement in the coastal zones and enclosed water bodies having limited exchange rates with the open sea, due to long lag-phases of biomass development.

Keywords: Phytoplankton, Mersin Bay, Mediterranean Sea

This study aims at assessing the combined effect of nutrients, and metals and organics extracted from sediments to seawater on the production and biomass enhancement of coastal and offshore plankton communities in the Mersin Bay, NE Mediterranean Sea. High and low harbor sediment concentrations of Samandag (4.5 g/L and 0.75 g/L) and Mersin (9 g/L and 1.5 g/L) were added to local coastal and off-shore phytoplankton communities sampled off Erdemli (Mersin Bay). Every 24 to 48 hours, chlorophyll-a, phytoplankton and nutrients were sampled and measured. Limited light penetration by suspended matter (Gameiro *et al*., 2011) might have inhibited photosynthesis leading to lower chl-a concentrations in the high sediment treatments; the results are illustrated in Figure 1. Enhancement of phosphate, silicate and nitrate+nitrite concentrations by sediment in the off-shore communities led to selective uptake of reactive –P in the treated communities within the first 72 hours (not shown), indicating P-limited algal production (Tüfekçi *et al*., 2013). Similar picture appeared in the silicate uptake rate for the on-shore communities, perfectly mirroring the chlorophyll-a increase, indicating diatom dominated on-shore communities.

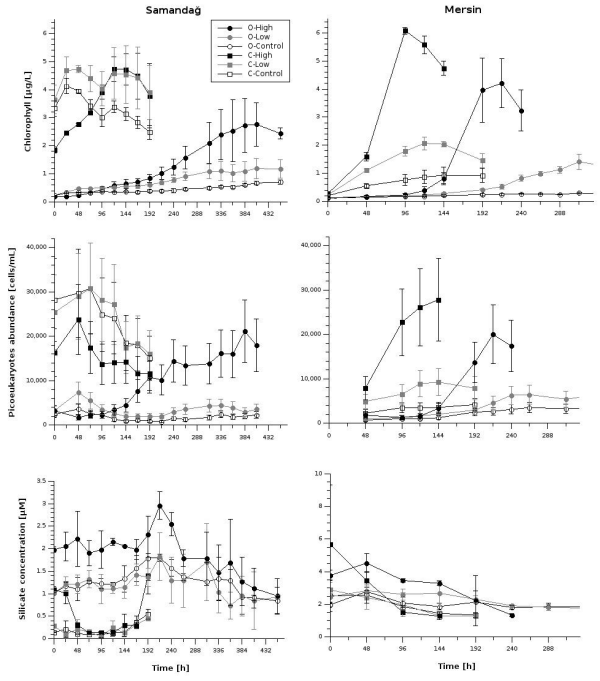

Fig. 1. Time-dependent development of chlorophyll and silicate concentrations, Picoeukaryote abundances in the Samandag (left) and Mersin (right) sediment added communities taken from the off-shore (O) and squares and the coastal zone (C) and circles of Mersin Bay off Erdemli; black-filled = high and gray-filled = low concentration, white=control

Oligotrophic off-shore communities are dominated by heterotrophic bacteria and small celled cyanobacteria, Synechococcus and Prochlorococcus (Agawin *et al*., 1998). Flow-cytometric analyzes clearly show marked enhancement in Synechococcus with the increased amouns of sediments added to the natural seawater samples. However, no Prochlorococcus enhancement was observed in the samples. Picoeukaryotes increase followed chlorophyll changes in the treatments.

All metal and total carbon (TC) concentrations were higher in Mersin sediment (Table 1) respectively to Samandag sediment whereby total organic carbon (TOC) and total nitrogen (TN) were higher in Samandag sediment. Higher TOC concentration might be the result of a higher productive area and thus higher POM export to the bottom. Even the concentrations are higher in Samandag sediment, the ratio of TOC/TN with 11.18 for Samandag and 12.9 for Mersin are within normal values and both higher than the Redfiel-ratio, suggesting that more labile fraction of POM in sediment already degraded by biochemical processes and limited inputs of labile organic pollutants into water column during dumping activities. However, metal contents of sediments might have a negative effect on algal production. For example, a significant toxicity of similar copper concentrations on phytoplankton and bacterial production was observed (Nayar *et al*., 2004).

Tab. 1. Metals components, total carbon, organic carbon and nitrogen concentrations in the sediments

Parameter per unit sediment	Cr [mg/kg]	Mn [mg/kg]	Fe [g/kg]	Co [mg/kg]	Ni [mg/kg]	Cu [mg/kg]	Zn [mg/kg]	Cd[mg/kg]	Pb [mg/kg]	Al [g/kg]
Samandağ	297	577	30,7	32,6	394	17,4	40,8	0,194	4,98	17,7
Mersin	372	644	45,7	35,2	883	24,7	76,7	0,38	22,8	38,8
Parameter per unit sediment	**TC [mmol/g]**	**TOC [mmol/g]**	**TN [mmol/g]**							
Samandağ	3,48	1,01	0,09							
Mersin	4,62	0,37	0,03							

Comparison of these results indicates that dumping of dredged material into nutrient-rich coastal areas are expected to have limited contribution to the pelagic phytoplankton community as compared to its effect on the offshore community. Further, a lag-time of 96-144 hours in biomass increase appears to limit the effect on bigger celled species of one-time sediment dumping due to dilution of nutrients dissolved from dumped materials via regional currents.

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