

# EFFECTS OF TERRESTRIAL INPUTS ON PARTICULATE ORGANIC MATTER (POM) COMPOSITION (C/N/P RATIO) IN SURFACE WATERS AND SEDIMENTS OF THE MERSIN BAY

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## Abstract

For the assessment of impacts of terrestrial nutrients and organic matter inputs on the elemental composition (C/N/P ratio) of bulk POM in seawater and surface sediments of highly and low productive zones (8-50 m depth ranges) of Mersin Bay, located at northeastern Mediterranean (NE), two field surveys were performed in April 2014 and February 2015. Eutrophication-related parameters (nutrients, Chlorophyll-*a*, (Chl-*a*) and dissolved oxygen (DO)) and POM in the surface and bottom waters were measured. Geochemical properties were also determined to understand effects of land-based sources on POM composition and concentrations in surface sediments.

*Keywords: Organic matter, Nutrients, Sediments, Mersin Bay*

Although the eastern Mediterranean is one of the world's oligotrophic seas due to limited nutrient inputs to its surface waters [1-2], its coastal ecosystem is highly fueled by nutrient inputs from land-based sources mainly by river discharges [3]. High nutrient concentrations (DIN: 10-16  $\mu\text{M}$ ,  $\text{PO}_4$ : 0.1-0.2  $\mu\text{M}$ ) of polluted coastal surface waters enhanced Chl-*a* and bulk POM concentrations in the near-shore zone of the bay in spring and winter period (Figure 1). Surface POM concentrations reached the peak values of 77-107  $\mu\text{M}$  for POC and 6-13  $\mu\text{M}$  for PON, with C/N ratios of 6.0-10.7 in the eutrophic coastal zone, decreasing by at least 5-10 fold in less contaminated central bay waters. Similar regional distribution was also observed in total particulate phosphorus (TPP) concentrations, decreasing from 0.2-0.5  $\mu\text{M}$  in polluted coastal waters to 0.03-0.10 in the central bay. However, no similar changes were seen in the C/N ratio varying regionally and seasonally between 6 and 11 whilst POC/Chl-*a* ratios varied regionally between 76-1531 indicating contributions of detrital and heterotrophic biomass to the POM pool within the bay. Regional variations were also appeared in the surface PON/TPP ratio of bulk POM, ranging between 11 and 56, with greater ratio values in more productive coastal waters. Molar ratios of POC/PON and PON/TPP ratios, derived from regression analyses of the particulate data, were about 6.84 and 20.5 in the productive bay waters, implying P-limited primary production in the Mersin Bay as also experienced in recent studies [4].

POM enhancement in the highly productive coastal waters had limited impact on the POM content of the coastal surface sediments. Higher concentrations of organic matter were observed in the less contaminated sites of the central bay. The TOC concentrations in sediment increased from 0.4-0.5 mmol/g dw (dry weight) in the near-shore zone to levels of 0.6-0.63 mmol/g dw in muddy sediments of the central bay. The TOC/TN molar ratio of sediment was more variable and greater than the ratio in the bulk POM of surface waters, indicating selective bio-chemical degradation of more labile N-rich organic compounds in surface sediments. The large spatial and temporal variations appeared in TN/POP ratios of bulk POM and organic matter of surface sediments: The ratio was markedly high (> 50) in the polluted and highly productive coastal zone sediments in the spring, whereas the winter ratios merely ranged between 13 and 28, consistent with changing grain-size distributions of the samples. Lower N/P molar ratios were consistently determined in the muddy sediments of the central bay fed by fine particles of terrestrial origin.

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## References

- 1 - UNEP, 1989: State of the Mediterranean Marine Environment. MAP Technical Series No. 28, UNEP, Athens.
- 2 - Yilmaz, A., Tugrul, S. 1998. The effect of cold- and warm- core eddies

on the distribution and stoichiometry of dissolved nutrients in the northeastern Mediterranean. Journal of Marine Systems, 16, 253-268.

3 - Krom, M. D., Herut, B., and Mantoura, R. F. C.: Nutrient budget for the Eastern Mediterranean: implications for P limitation, Limnol. Oceanogr., 49, 1582-1592, 2004.

4 - Tüfekçi, V., Kuzyaka, E., Tüfekçi, H., Avaz, G., Günay, A.S., Tugrul, S. 2013. Determination of limited nutrients in the Turkish coastal waters of the Mediterranean and Aegean Seas. J. Black Sea/Mediterranean Environment Vol. 19, No. 3: 299-311.