# VIRIOPLANKTON AND BACTERIOPLANKTON DYNAMIC IN AN ITALIAN COASTAL AREA OF THE SOUTHERN ADRIATIC SEA SUBJECTED TO POLLUTION

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## Abstract
The discovery that viruses may be the most abundant organisms in marine ecosystems, surpassing the number of bacteria by an order of magnitude, has inspired a resurgence of interest in viruses in the aquatic environment. In the present study we evaluated the virioplankton, total culturable heterotrophic bacteria, luminous bacteria, *Escherichia coli* and somatic coliphages abundances, over an annual cycle, at two sampling points located in the Southern Adriatic Sea (Italy) differently subjected to a sewage pipe impact.
*Keywords: Adriatic Sea, Bacteria, Bio-Indicators, Sewage Pollution*

**Introduction**
Coastal marine ecosystems are characterised by a complex set of dynamic interactions between organisms including viral lysis [3]. Marine viruses are the most abundant biological particles in the sea [4]. The evidence to date suggests that virioplankton communities are mainly composed of bacteriophages and that by specifically infecting heterotrophic bacteria, virus are likely to play critical roles in the structure and function of aquatic food webs[1]. Although an increasing number of work has been conducted on marine viruses, little is known about their biology and ecology (relationships with hosts and the environment) in the Southern Adriatic Sea Italian coasts. The aim of this study was to describe the virioplankton, total culturable heterotrophic bacteria, luminous bacteria, *Escherichia coli* and somatic coliphages abundances over an annual cycle as well as the relationships between these planktonic components at two sampling points located in a coastal area of the Southern Adriatic Sea (S. Cataldo, Lecce, Italy). The former point was near the mouth of a sewage pipe and the latter at 1000 m from the pipe.

**Material and Methods**
Water samples were collected from surface (0.2 m depth) in 300 ml capacity sterilized glass containers. To enumerate viruses water samples were filtered through 0.02 µm pore-size filters, stained with SYBR Green I and observed by an epifluorescence microscopy. For enumeration of heterotrophic and luminous bacteria the number of colony forming units was determined by plating 1 ml of undiluted seawater in triplicates on Complete Seawater. The plates were incubated at 21°C for 20-24 hours. *Escherichia coli* presence was assessed through the filtering membrane technique. Somatic coliphages were detected through the double-layer agar technique, after a tangential flow ultrafiltration (on 10 l of water) to increase the recovery capability for phages.

**Results and Discussions**
Our results indicated that microbial parameters displayed a much higher abundance in the polluted point where the mean virioplankton abundance was 1.2 x $10^7$ cells/ml and mean culturable heterotrophic bacteria density was 6 x $10^3$ cells/ml. Furthermore viral density followed the pattern of luminous bacteria abundance as confirmed by regression analysis [2]. In the impacted point the highest concentrations of *Escherichia coli* were recorded in the summer-autumn period (100 c.f.u./100ml) whilst in January they showed values near to zero. By contrast, in the point at 1000 m from the discharge pipe, somatic coliphages concentration recorded the highest value (128 p.f.u./100ml) in the coldest month (January). Our results show that somatic coliphages are less sensitive to temperature than the classical indicators of faecal contamination. These findings suggest that somatic coliphages could be used as indicators to evaluate the quality of coastal seawater, in order to provide a more accurate analysis of the hygienic-sanitary quality of the marine ecosystem.

## References
1 - Fuhrman J.A. and Schwalbach M., 2003. Viral influence on aquatic bacterial communities. *Biol. Bull.*, 204: 192-195.
2 - Perego P., Fanara L., Zilli M. and Del Borghi M., 2002. Applications of luminous bacteria on environmental monitoring. *Chem. Biochem. Eng Q.*, 16: 87-92.
3 - Weinbauer M.G., 2004. Ecology of prokaryotic viruses. *FEMS Microbiol. Rev.*, 28: 127-181.
4 - Wommack K.E. and Colwell R.R., 2000. Virioplankton: viruses in aquatic ecosystems. Microbiol. *Mol. Biol. R.*, 64: 69-114.