SHORT-TERM CHANGES OF HYDROBIOLOGICAL FEATURES IN THE GULF OF MILAZZO (TYRRHENIAN SICILY)

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Abstract
In the framework of a wider National research program dealing with costal waters quality (MIUR-Cluster10-SAM) two seasonal hydrobiological cruises were carried out in the Gulf of Milazzo to study the changes in thermo-haline structures, nutrients concentrations and phytoplankton biomass (expressed as chlorophyll*a*) distribution. Two water masses: Tyrrhenian Surface Water in the uppermost 50m-thick layer and Levantine Intermediate Water below them are present and flow in the same direction (W-E). Chl-*a* distribution showed a clear phytoplanktonic accumulation in a frontal zone located between nearshore and offshore waters during both stratification and mixing periods.

Key-words: hydrography, chlorophyll a , Tyrrhenian Sea

Introduction

In the Mediterranean sea the phytoplankton biological cycle is driven by seasonal conditions: in summer when water stratification exists the phytoplankton community is in a stationary phase after spring growth; in winter when vertical water mixing prevails autotrophic populations are in lag period preceding the late-winter development

The aim of this short note is to describe the hydrological and trophic conditions during fall-to-winter transition when convective mixing destroyes the pycnocline and enriches the surface waters with nutrients.

The Gulf of Milazzo is a natural Bay of about 25 Km^2 of the nothern coast of Sicily, comprised between two Capes of Milazzo (west side; 38°16'N-15°14'E) and Rasocolmo one (eastern side; 38°18'N-15°33'E), and open to the Tyrrhenian sea. The central stretch of coast hosts wide sandy beaches and several seasonally-controlled stream outflows. The city of Milazzo and its harbour are located in the lee of Cape Milazzo and in the neighbours a refinery and a thermal power plant have been settled in 1960s. The continental shelf is narrow and irregular having a width of ~0.2 km off the C° Milazzo and ~ 2 km in the center where at ~1.4 km from the coast reaching 500m depth. Hydrodynamics in the Gulf is complex: a general cyclonic circulation in the uppermost layer of off-shore waters can be identified, while the inner part is characterized by a smaller anticyclonic structure influenced by geomorphology and winds. The most frequent winds are from SE and from NW, this latter can be often very intense in winter and spring.

Sampling

Sampling was performed on board the *M/V L. Sanzo* on December 18th 2002 and on February 26th 2003. The hydrographic surveys (CTD/Rosette) approached the area through eleven fixed stations on three transects. Three samples were taken in the layer hosting the Deep Chlorophyll Maximum (above-DCM, DCM and below-DCM).

Temperature and conductivity, salinity, and dissolved oxygen were recorded using SBE-911+CTDO profiler equipped with Turner Scufa fluorometer (for Chl*a*). CTD and fluorescence data quality was checked by comparison with lab samples.

Inorganic phosphorous and nitrogen (PO_4 and NO_3 [1]; NH_4 [2]) were analyzed using US/VIS spectrophotometer; and Chl*a* concentration was determined by spectrofluorometer [3].

Results and Discussion

In December surface warmer waters (17.56 °C) were separated by a thermocline, in the layer between 50 and 100m, from the deeper waters (14.14 °C), while in February the homogeneity of the thermal field existed (13.74 and 14.53 °C). Surface salinity (37.82 ppt) was homogeneous up to 60m then an halocline down to 70m (37.85-38.65 ppt) was found in late-fall, whereas in February the salinity resulted constantly increasing with the depth (37.60-38.62 ppt) along the whole water column. Though different to each other the thermo-haline structures of the transects in late-fall and winter showed a high spatial homogeneity.

Nutrient concentration in late-fall showed mean values of 0.29±0.19 µM for PO_4, 0.21±0.18 µM for NH_4 and 1.81±2.07 µM for NO_3, whereas higher values were found in February (0.36±0.24 µM for PO_4, 0.70±.065 µM for NH_4 and 3.26±4.36 µM for NO_3) due to winter mixing which enriched euphotic layer.

Chl*a* concentration in the 0-80m layer ranged between 0.12 and 0.44 μgl^{-1} with a mean value of 0.14±0.04 μgl^{-1} in December and 0.25±0.08 μgl^{-1} in February when the values were doubled . In both periods the integrated Chl*a* values (0-80m) exhibited a general coast-to-offshore increase evidencing a weak frontal zone linked to the hydrodinamic coastal circulation (Fig. 1).

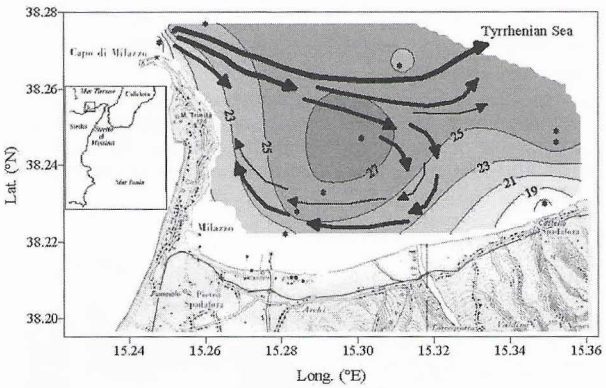

Fig. 1. Gulf of Milazzo : water circulation and integrated Chl*a* (mg m^{-2}) of the 0-80m layer in winter.

Vertical Chl*a* distribution showed a pattern typical of temperate waters with the DCM generally located at 50m of depth in both periods and stations. The DCM depth during the measurements uplifted with respect to that observed in late spring and the one known for Tyrrhenian off-shore waters as well [4]. This trophic condition seems to be linked to both hydrographic conditions and phytoplankton cycle. In late fall the autotrophic community shows lower biomass when a weak water stratification exists; whereas in February with omogeneous water column, Chl*a* presents higher values in relationships to the bimodal plankton pattern. This condition is supported by the vertical distribution of dissolved oxigen maximum, which is located above the DCM in December and below it in winter.

In conclusion short-term hydrobiological changes were evidenced by different thermo-haline structures and nutrients and chlorophyll*a* concentrations. A frontal zone between the costal and the off-shore waters, due mainly to meso-scale dynamical structure, was evidenced in both periods by accumulation of phytoplankton biomass.

References

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