

Do gelatinous "Macroaggregates" in the northern Adriatic influence the biomass dynamics of free-living microheterotrophs ?

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An investigation of the effect that gelatinous "macroaggregates" have on the smaller size classes of free-living plankton was conducted during the periods of summer stratification in 1986, 1987, 1988, 1989 and 1990. Sampling was conducted along a trans-Adriatic trophic gradient from off the Po delta, Italy (sta's 10, 9) to the Istrian peninsula, Croatia (sta. 6), and southward toward the middle Adriatic (sta. 23). Water column plankton populations were enumerated by epifluorescent or inverted microscopy. The analysis of autotrophic populations is currently being published (REVELANTE and GILMARTIN, 1992). Herewith are reported some of the observations on the microheterotrophs.

The primary production, and dependent trophic levels, of the pelagic food web of the northern Adriatic fluctuate widely as a function of interannual differences in the Po River nutrient input (GILMARTIN *et al.*, 1990). In 1986 and 1988 the "Po effect" was strong relative to other years yet, fortuitously, gelatinous "macroaggregates" were strongly developed during the 1988 cruises and absent during the 1986 cruises.

The free-living phytoplankton populations in the ambient water did not exhibit a significant difference in the amplitude of cell densities in 1986 (a nonaggregate year), and 1988 and 1989 when large phytoplankton containing "macroaggregates" were present. During all years the biomass dynamics of the free-living autotrophs were primarily related to the temporal characteristics of Po River discharge and/or horizontal advection of Po waters, and were independent of the presence or absence of "macroaggregates" (REVELANTE and GILMARTIN, 1992).

Similar trends are here reported for the microheterotrophic populations of free-living bacteria. The data are summarized in Figure 1. which presents the average mean water column densities of microheterotrophs along the west to east trophic gradient, and southward, during the summer stratified seasons of 1986, 1987, 1988 and 1990.

The densities of free-living heterotrophic bacteria at western stations (10, 9) had similar amplitudes in the "macroaggregate" year 1988 compared with other years when "macroaggregates" were not present. The spatial distribution of free-living heterotrophic bacteria, and the observed gradients, mirrored those of the small pico-autotrophs, and were primarily related to hydrographic conditions. Preliminary analysis also indicate that other microheterotrophs (unpublished data), such as microflagellates and ciliated protozoans, also did not significantly increase in the ambient water when "macroaggregates" were present.

During the sampling cruises high densities of free-living heterotrophic bacteria were observed in both 1986 and 1988, strongly implying that the presence of high abundances of large "macroaggregates" in 1988 did not influence the biomass of free-living water column populations. However attached microheterotrophic populations, associated with micro-flocs and larger aggregates, did increase significantly during "macroaggregate" years (REVELANTE and GILMARTIN, 1992).

In addition, in 1986 and 1988 the oceanography of the northern Adriatic, combined with the discharge characteristics of the Po River, created a circulation pattern under which the "Po influence" was strong in eastern, and even in southern waters. Yet, over the entire range, free-living microheterotroph population densities differed little between 1986 and 1988 despite 1986 being a non-aggregate year.

These data indicate that during the stratified season the population distribution and biomass characteristics of the free-living smaller plankton size classes in the water column, whether autotrophs or heterotrophs, wasn't changed by the presence of gelatinous "macroaggregates". This strongly implies dependent elements of the pelagic food web in the region were similarly unaffected.

We speculate that in "macroaggregate" years a separate and distinct food web is introduced into the northern Adriatic ecosystem, which is superimposed on top of the basic pelagic food web. The "packaging" of the new organic substrate, represented by the "macroaggregates" creates a spectrum of larger than usual particle size classes which are thus unavailable to extant pelagic consumers. As a consequence it is probably processed by a microbial loop through a distinctly separate food web directly and physically associated with the "macroaggregates". Therefore we conclude that "macroaggregates" contribute to the pelagic food web primarily through decomposition and nutrient regeneration rather than by serving as "prey" for primary consumers. This conclusion in no way ignores the impact that sinking "macroaggregates" may have on the benthic community, but only to the impact they may have on the pelagic community.

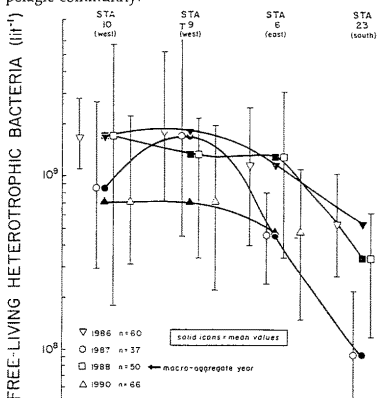


Fig. 1. The regional and temporal distribution of microheterotrophs. Filled icons (v) are annual mean icons repositioned so that their curves nest vertically.

REFERENCES

GILMARTIN M., DEGOBBIS D., REVELANTE N. and SMODLAKA N., 1990.- The mechanism controlling plant nutrient concentrations in the northern Adriatic Sea. *Int. Revue ges. Hydrobiol.*, 75: 425-445.
 REVELANTE N. and GILMARTIN M., 1992 (?).- The lateral advection of particulate organic matter from the Po delta region during summer stratification, and its implications for the northern Adriatic. *Estuar. Coast. Shelf Sci.* (in press).