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Budgets of C, N and P for the Northern Adriatic mussel farms: a model study

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In the last fifteen years, mussel production in Italy has been steadily increasing, peaking in 2003, when a production of $100x10^3$ kg was recorded. This trend is mainly due to the increase in landings from mussel culture, which, in 2002, accounted for about 70% of the country annual production.

The presence of a farm leads to a local decrease in seston concentration, accompanied by an increase in dissolved ammonia concentration, due to mussel excretions, and enhanced benthic-pelagic fluxes of C, N and P, due to faeces and pseudofaeces deposition on the sediment and their remineralization. Furthermore, relevant amounts of C, N and P are exported when mussels are harvested.

This work represents a first attempt at studying the influence of suspended mussel farms on the biogeochemical cycles of C, N, P, in the northern Adriatic sea, by means of an integrated numerical model. The northern Adriatic region accounts for about 50% of the Italian mussel production. At present, the model is made up of four modules: a) an individual-based model of the mussel; b) a 2D pelagic reaction-transport model; c) a particle-tracking deposition model; d) a 1D early-diagenesis model. Model application at the farm scale allowed to estimate the yearly amounts of C, N and P ingested by the cultivated mussels, deposited to the seabed as faeces and pseudofaeces and removed trough mussel harvesting. N fluxes due to mussel excretions and N and P fluxes associated with remineralization of biodeposits were also estimated. The integrated model was subsequently applied at a regional scale, in order to get a crude estimation of the influence of mussel farming on the C, N and P biogeochemical cycles

in the northern Adriatic sea.

On the basis of the results obtained, the integrated model can be seen as an useful tool both for the theoretical study of processes and for the sustainable management of coastal zone activities. Furthermore, the budget approach presented, can help in understanding quantitatively the environmental role of shellfish farms with respect to the control of nutrient.