The impact of high densities of mussel (Mytilus galloprovincialis) on the cycling of metals in an artificial environment of Osaka Bay, Japan

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The impact of biodeposition by dense bivalve population (Mytilus galloprovincialis) on the cycling of heavy metals in the vicinity of artificial vertical structures in Osaka Bay was studied. Such studies are important because, as a consequence of land reclamation, artificial structures nowadays occupy more than 30% of the coastline in Japan, and over 90% in Osaka Bay, which is, as an enclosed coastal sea, especially sensitive on development pressures and coastal pollution. Most of these structures are vertical seawalls (breakwaters and quays) surrounding harbors and ports, forming low energy environments with slow turnover rates, thus resulting in enhanced sedimentation and high anthropogenic impact.
As a model for investigation, Amagasaki port was chosen, as one with the worst environmental conditions in Osaka Bay. At the time of the experiment (late July) biomass was maximal and activity of the mussels was high due to increased concentration of phytoplankton in summer. Sediments and biodeposits were collected in 15 sediment traps (90 cylinders) placed on five sampling stations at depths corresponding to average depth in the port. Two stations were at distance of 1m from the quaywall with attached colonies of mussel *Mytilus*. Traps from these points collected particles from natural sedimentation together with faeces and pseudofaeces (biodeposits). Other traps were set on three sampling stations at 50 m distance from the wall. One group comprised of empty cylinders, while in the other group we placed living mussels (with known mass amount). The third group was control, containing dead mussels. Naturally sedimenting material was collected in all cylinders, and in those containing live mussels, the faeces and pseudofaeces was also collected.
All pretreatments and analytical procedures were performed in the laboratory. After the digestion the sediment trap material was analyzed using flame and graphite furnace AAS for determination of following metals: Fe, Mn, Zn, Cu, Pb, Cd and Cr. Analytical assurance was performed by measurements of three certified reference materials for trace metals in marine sediments.
The summed deposition due to sedimentation and biodeposition was compared with deposition in mussel-free traps. Biodeposition was calculated as the amount of material collected in each mussel cylinder minus the average sedimentation obtained in the control traps.
Bivalves and their support structures doubled the rate at which suspended matter was being added to the sediment (41.96 $gm^{-2}d^{-1}$ vs 20.15 $gm^{-2}d^{-1}$ for natural sedimentation). This consequently leads to an increase in the metal deposition rates of 42% for Cd to 144 % for Zn. These results support the hypothesis that the presence of dense mussel population leads to increased flux of metals from the water column to the harbor bottom altering their movement around vertical structures. On the basis of obtained results we tried to establish whether the impact of biodeposition on the metal concentration and distribution around vertical structures is significant or trivial in the period of experiments.

The variability of Amur River water quality: linkage with the biogeochemical processes and fluxes of chemical substances in Amur River Eastuary

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Amur River is the biggest river of the Russian Far East with mean water discharge about 11,000 m^3/s but with average solids load as low as 72 g/m^3. The minimum water discharge (about 2,000 m^3/s) is observed during late autumn winter under ice low water. The spring snow melting high water (May-July) and summer rain floods (August-September) have water discharge 15,000-28,000 m^3/s (maximum 40,000). The low water period is accompanied by the increased mineralization (TDS) up to 130 mg/l with the diminishing down to 60 mg/l and less at the high water period due to dilution by the precipitations (rains and snow)

with low TDS. The same seasonal patterns are observed for the macro-ions and some nutrients (NH_4^-), though for some other substances (Si, COD) there is positive relationship with water discharge. The beginning of snow melting flood is often outstanding in terms of elevated concentration of many chemical substances accumulated in the snow during the winter.

The Amur water runoff has increased by 10%-12% in a hundred-year period of observation due to increase of atmospheric precipitation, but in the same time there is obvious trend of water runoff decrease during last 25 years. This trend is accompanied by the clear rising of the mean annual mineralization from 46-64 mg/l to the 93-110 mg/l.

The Amur River Estuary is localized in the vast (about 5,000 km^2) shallow (average depth 2.5 m) straight between Sakhalin Is. and mainland. During the summer the prevailing direction of the river flux is northward and the plume of brackish water can occupy east part of Sakhalin Bay.

The distribution of some dissolved chemical substances along the salinity gradient have been studied during the summer high and low water. The non-conservative decrease of Fe at the salinity less than 10%, and conservative decrease of Cu and Ni were observed. Dissolved Mn always shows the increase at the intermediate salinity. Cd is the only metal studied showing different distribution at the different hydrological conditions. The more pronounced stratification in the north part of estuary and disposition of water with salinity 10%— 20□ in the southeast part of Sakhalin Bay during high water allow to distinguish the desorption from riverine suspended matter as a key reason for the dissolved Mn distribution. Flux from bottom sediments is a master variable for the dissolved Cd distribution in the estuary with very low initial concentration of metal in Amur river water and suspended solids. The change of the chemical composition of suspended matter in estuary is controlled firstly by the ratio of terrigenous alumosilicate material enriched by Al and Fe, and marine biogenic particles enriched by Cu, Mn, Cd, and in some cases by Ni. There is relationship between accumulation of metals in the biogenic suspended solids and ability of the phytoplankton. The high plankton biomass is accompanied by the decrease of Zn, Pb and Ni concentrations in the suspended solids, but Cu shows inverted relationship.

The chemical composition of Amur river water determines the character of the processes occurring in the estuary but existing data allow to suppose the some independence of the variation of river flux at least during the warm period.

Assessment and control of anthropogenic impacts of the Dniestr River upon the estuarian zone of the Black Sea coast of Ukraine

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Discussed at the paper are results of assesment of anthropological impacts of economic developments at the Dniestr River basin, including impacts caused by hydroengineering construction upon the estuarian areas of the Black Sea coast. Assessment was carried out under the framework of a number of international and local projects, funded by the World Bank, UNDP and UNEP . Shown and discussed are results of reckless development policy at this river basin in the former USSR, lack or poor enforcement of environmental regulations relating to this river and the estuarian zone. Shown also are benefits and obstacles to efficient coordination and cooperation in management of this trans-boundary river basin which passes through Ukraine, Moldova and again through Ukrainian part (Odessa region). Considered are various types of man-made impacts on water quality, both at the river and estuary,pollutants transfer and pollution load delivered by the river to the estuary as well as impacts on wildlife, biodiversity and touristic potential of the area.

Reviewed also are political and economic tools for possible minimization of the pollution load. Underlined and demonstrated are possible environmental policy upgrading and improvement approaches, the need for better enforcement and the need for reform of some river basin and coastal zone management regultions, both on national and international level. Touched upon are also issues of general public and private sector involvement into monitoring, enforcement and financial support for costal zone management. Issue relating to NGOs role in public education and public awareness raising on issues of estuaries and river basin cleaness maintenance are also discussed.

Catchments' value-pressure assessment and its management strategies in Shanghai, China

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