

# Application of light attenuation measurement for determination of vertical plankton distribution in sea water

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The investigation of the horizontal and vertical distribution of phyto- and zooplankton communities is extremely important for the assessment of the ecological status of marine environment, especially in conditions of increasing anthropogenic influence. There is much evidence that the Black sea coastal ecosystem has been under the severe impact of eutrophication during the last 20 years. As a consequence a dramatic increase of phytoplankton blooms was registered, accompanied by serious changes of its species succession, biological cycles and biomass, with corresponding alterations in zooplankton too. The high time-space variability, the patchiness of its horizontal distribution and vertical aggregation increase the necessity of reliable express methods for monitoring to be developed. The increased abundance of plankton under the influence of high eutrophication of the Black Sea as a stratified basin, results in a dramatic change of the optical properties of the water masses especially in the coastal regions. Light attenuation in the water could be used for determination of vertical plankton distribution, abundance assessment and community aggregation down the water column. A specially constructed device based on measuring attenuation of a directed light beam in water has been used. The relationship between light attenuation (extinction) and total plankton abundance and chlorophyll 'a' fluorescence is evaluated in laboratory experiments on sea water samples with modelled plankton biomass. A good relationship between extinction coefficient as a measure of light attenuation and total phyto- and zooplankton biomass as well as chlorophyll 'a' fluorescence has been established. The experimental results were used for calibration of the device for in-situ application.

Two series of in-situ measurements were accomplished in the region of Varna Bay canal connecting Varna Lake and Varna Bay. During the first one five points were sampled and during the second – three points. At each point light attenuation was measured at depths from 0.5m to 8.5m with an interval of 1m, additionally water bottle samples were taken at three depths 0.5, 4.5 and 8.5m. The samples were processed by classical methods. In addition the chlorophyll 'a' (as a measure of total phytoplankton biomass) was analyzed on a Turner Design Fluorometer (model 10-000R).

As a result of the study a well expressed and steady relationship between vertical distribution of extinction coefficient and chlorophyll 'a' measurement has been established. This gives ground to suggest that light attenuation could be used as an express method for determination of vertical plankton distribution in sea water. More detailed results could be obtained by applying “express” and “classic” methods of measurement in parallel.