

Phosphorus balance at various water flows in the lake restored by hypolimnetic withdrawal.

*Czesław Mientki, Julita Dunalska
University of Warmia and Mazury in Olsztyn
Department of Environment Protection Engineering
Prawocheńskiego 1
10-957 Olsztyn, Poland*

Abstract

Lake Kortowskie is restored by the hypolimnetic withdrawal method: rich in nutrients near-bottom waters are removed by a pipeline directly to the outflow instead of the natural outflow of surface waters. It has been found out that the amount of water discharged through the pipeline and therefore the amount of removed phosphorus depends on the surface inflow. The water balance of the lake in summer is unfavourable whereas the phosphorus balance very favourable. The latter is determined by the diminishing phosphorus loads entering the lake, and by the increasing amounts of phosphorus released from the bottom sediments. Any disturbance at the interface bottom sediments-overlying water results in continuous release of „new” phosphorus amounts to the water. In the same time near-bottom water withdrawal to the outflow cause deficiency with this element in the lake ecosystem. For optimising the restoration process such rate of pipeline outflow should be established, to reach maximal phosphorus removal at an existing hydrological balance.

Key words: Lake Kortowskie, „Olszewski’s pipeline”, eutrophication.

**What makes *Chironomus* more abundant above the bottom.
Field experiments in mesocosms**

Zdzisław Kajak, Paweł Prus

*Institute of Ecology PAS,
Dziekanów Leśny, 05-092 Łomianki, Poland
e-mail: ekolog@warman.com.pl*

Abstract

In looking for factors affecting *Chironomus plumosus* (L.) abundance and its fluctuations – the comparison of its numbers has been done in the bottom (at 6 m depth) and in “mesocosms” – trays with the same bottom sediment elevated 0.4-1.2 meter above the bottom. The experiment was carried out, in a shallow, strongly eutrophic, polymictic, lowland dam reservoir, where the abundance of *Chironomus* is among the highest in nature.

The total abundance was on the average several times higher and more stable and larvae developed more quickly in trays over the bottom than in the same mud at the bottom. All this was probably due to better and more stable oxygen conditions above the bottom than at its very surface. Usually no differences in the abundance were found between levels 0.4, 0.8 and 1.2 m above the bottom, what indicates that conditions at all these levels were similar and different from those at the very bottom.

The average density, and especially spring peak numbers in and above the bottom, were much higher in the year 1993 than in 1996 (the ratio of average numbers 1993/96 being similar – 2.3 and 2.6 for the bottom and trays respectively). It was probably due to a higher food supply (mostly small diatoms) by rivers and also due to weaker spring water flow in 1993. The very strong decline from high spring peak numbers to summer minimum seems to result from interconnections between larvae and perhaps also increased fish pressure, after the spawning period.

Key words: oxygen and benthos; benthos abundance; dam reservoir; population dynamics

Optimal management of the dam reservoir ecological system

Vladimir V. Menshutkin, Romuald Z. Klekowski

International Centre for Ecology, Polish Academy of Sciences, Dziekanow Lesny,

M.Konopninckiej, 1, Poland

e-mail mce-pan@mail.incom.pl

Abstract

The task of optimal management of the dam reservoir ecosystem was formulated in a very abstract and general way. To solve this problem, on the simplified example of such an ecosystem, method of fuzzy logic was employed. Various scenarios of ecosystem management of dam reservoir has been investigated. Water level changes, inflow of waste waters and fish culturing were taken into consideration. It was shown that for practical management of dam reservoir it is necessary to construct a complex model of such an ecosystem.

Key words: modelling, aquatic ecosystem, control, optimisation

Metabolism of bottom sediments in littoral of submountain dam reservoir and in the river feeding it

Aleksandra Starzecka, Teresa Bednarz

*Karol Starmach Institute of Freshwater Biology, Polish Academy of Sciences,
Sławkowska 17 str., 31-016 Kraków, Poland
e-mail: starzecka@zbw.pan.cracow.pl., bednarz@zbw.pan.krakow.pl*

Abstract:

The paper presents the differences in metabolic processes of the bottom sediments of the River Raba up- and downstream the reservoir and in the Dobczyce Reservoir (southern Poland). In the sediments of the reservoir character and the intensities of metabolic processes were similar. In the river above the reservoir the metabolism of sediments has the autotrophic character (the ratio of primary production to oxygen respiration P/R exceeded 1 value) and heterotrophic one in the river below the reservoir ($P/R < 1$). The highest algal biomass (B_a) and low primary production (P) were found in the Raba River below the reservoir. At the downstream site organic matter the most refractory to biological degradation was presented. At this site the dominant part of energy (51%) was released by bacteria respiration (R_b). In upstream and in the reservoir the share of respiration of algae (R_a) and bacteria (R_b) in R amounted 6-27% and the remaining organisms (R_r) 73-94%.

Key words: primary production, respiration, bacteria, algae

Heavy metals (Cu, Zn, Mn, Fe, Pb and Cd) in some short food chains in the lowland dam reservoir (Zegrzyński Reservoir, Central Poland).

Ewa Jurkiewicz-Karnkowska

Academy of Podlasie, Institute of Biology, Department of Ecology and Environment Protection, address: B. Prusa 12, 08-110 Siedlce, Poland, e-mail:phkarnk@astercity.net

Abstract:

The present work has been aimed at the analysis of heavy metal (Cu, Zn, Mn, Fe, Pb, Cd) fate in selected food chains comprising molluscs, their potential food, fish feeding on molluscs and predatory fish as well as mollusc faeces, *Chironomidae* larvae and fish feeding on them. The results generally indicate a decrease of heavy metal concentrations in the successive trophic levels. Taking into account limited bioavailability and relatively low concentrations of heavy metals in mollusc tissues, these animals are not supposed to be a threat to higher trophic levels in the Zegrzyński Reservoir ecosystem as regards metal contamination.

Key words: heavy metal transfer, bioaccumulation, molluscs, dam reservoir.

Nitrogen and phosphorus in surface microlayers of the estuarine, shallow lake (north Poland)

Jan Trojanowski, Czesława Trojanowska, Józef Antonowicz

*Department of Chemistry, University of Education, Arciszewskiego 22,
76-200 Słupsk, Poland*

Abstract

Higher nutrients concentrations were observed into the surface microlayer then in the subsurface of estuarine, shallow lake water. The thinner the surface microlayer, which means the closer it is to the water-atmosphere contact zone, the higher are concentrations of organic and inorganic phosphorus, as well as organic and ammonia nitrogen. Mean values of enrichment coefficients were usually positive. The highest values of these coefficients were found for organic phosphorus and organic nitrogen in relation to phosphates, ammonium nitrogen and nitrate nitrogen.

Key words: Surface microlayer, lake, nutrients

**The stimulative effect of hydrocortisone on photosynthetic pigments in the green alga
Chlorella vulgaris Beijerinck**

Romuald Czerpak, Andrzej Bajguz, Joanna Kalinowska

*University of Białystok, Institute of Biology, Świerkowa 20B, 15-950, Białystok, Poland
e-mail: czerpak@uwb.edu.pl; abajguz@uwb.edu.pl*

Abstract

Studies carried out on the alga *Chlorella vulgaris* (Chlorophyceae) showed that hydrocortisone applied in a concentration range of 10^{-4} - 10^{-5} M has a stimulating effect on its growth, i.e. the content of fresh and dry mass, and on the chlorophyll and carotenoid contents. Hydrocortisone was found to have its greatest stimulative effect on the biochemical parameters analysed in a concentration of 5×10^{-5} M between the 15th and 20th day of the alga culture (with the exception of monoxy-xanthophylls). The strongest stimulation was noted in the content of: chlorophylls (a+b), from 184 % - 200 %, the total carotenoid pool, 170% - 190%, including carotenes stimulated from 193 % to 208 %, xanthophylls with 2 oxygen atoms in the molecule 171 % - 191 %, and richly oxidated xanthophylls 146 % - 187 %. Maximum stimulation of the dry mass content was within the range of 138 % - 151 % whereas the weakest stimulation was noted in the monoxy-xanthophylls 121 % - 125 % as compared with the control (100 %). The studies showed that hydrocortisone, as a typical representative of animal glucocorticoids, also occurring in some species of vascular plants and probably in thallophytes, when applied in the optimum concentration range 10^{-4} - 10^{-6} has a fairly intensive stimulative effect on the growth of *C. vulgaris* cells and their content of photosynthetic pigments, i.e. chlorophylls (a+b) and carotenoids especially carotenes and xanthophylls moderately rich in oxygen.

Key words: chlorophylls, carotenoids, carotenes, xanthophylls

Comparison of the influences of hydrocortisone and progesterone on the content of protein and sugar in the green alga *Chlorella vulgaris*

Romuald Czerpak, Andrzej Bajguz, Agnieszka J. Bajguz, Danuta Iwaniuk

University of Białystok, Institute of Biology, Świerkowa 20 B, 15-950 Białystok, Poland
e-mail: czerpak@uwb.edu.pl; abajguz@uwb.edu.pl

Abstract

This paper presents the study concerning the influence of hydrocortisone and progesterone on the growth and the content of protein and sugar in the green alga *Chlorella vulgaris* Beijerinck (Chlorophyceae). Progesterone, at the concentration of 10^{-4} M, showed a lethal effect on *C. vulgaris* and hydrocortisone - at the concentration of 10^{-3} M. Hydrocortisone, in range of concentrations 5×10^{-5} - 10^{-4} M, showed the greatest stimulating activity in *C. vulgaris* on the content of sugar, in comparison to progesterone, which has a most stimulating effect in the range of concentrations 5×10^{-5} - 5×10^{-6} M. It was found that in *C. vulgaris* progesterone is more active than hydrocortisone on the content of cellular sugar. However, progesterone acted inhibitory on the content of protein. The lowest inhibition of sugar and protein was observed under influence of hydrocortisone at the concentration of 5×10^{-6} M. The biological activity of hydrocortisone in the *C. vulgaris* studied was greater than that of progesterone with regard to the protein content.

Key words: *Chlorella vulgaris*, hydrocortisone, progesterone, proteins, sugar

Indicator values in ecological description of diatoms from Polish lowlands

Barbara Rakowska

Department of Algology and Mycology, University of Łódź, ul. Banacha 12/16, 90-237 Łódź, Poland, e-mail: rakowska@biol.uni.lodz.pl

Abstract

The first estimate of diatom indicator values in Poland is presented. It comprises 455 diatom taxa occurring in ten ecologically different ecosystems: four rivers of various type and degree of pollution, limnocrenic and salty springs, oligotrophic springs, a dam reservoir, a brown coal excavation pit and a peat excavation pit. Indicator values are used to describe saprobity, trophic conditions, tolerance for pollution, oxygen demand, water alkalinity – pH, salinity, distribution and abundance. The compiled list of diatoms contains information about the conditions that are preferred by a given species, consequently, it may constitute a basis for the biological assessment of water quality.

Key words: saprobity, trophic conditions, tolerance for pollution, oxygen, water pH, salinity, distribution, abundance.

Bacteriological characterisation of a Baltic sandy beach in summer

Zbigniew Mudryk¹, Beata Podgórska², Anetta Ameryk²

¹*Department of Experimental Biology, Pedagogical University, Arciszewskiego 22, 76-200 Słupsk, Poland e-mail: mudryk@wsp.slupsk.pl*

²*Centre of Marine Biology, Polish Academy of Sciences, św. Wojciecha 5, 81-347 Gdynia, Poland*

Abstract

Studies on the spatial and vertical variability of saprophytic bacteria abundance and their physiological properties were carried out in Sopot (the Gulf of Gdańsk) during the summer of 1998 at four different points along a transect perpendicular to the water line. Colony forming units (CFU) bacterial counts reached 10^4 - 10^6 g dry wt. of sediment⁻¹. Bacteria were most abundant in the dune, and least abundant in the beach sand. Halotolerant bacteria were more numerous than limnotolerant ones. Ammonifying and uric acid decomposing bacteria constituted the most abundant physiological groups; sulphate reducing bacteria were least numerous.

Key words: Gulf of Gdańsk, sea shore, saprophytic bacteria, physiological properties

Phytoplankton-zooplankton interactions, size relations and adaptive responses. A short review.

Elżbieta Wilk-Woźniak, Agnieszka Pocięcha, Halina Bucka

*Karol Starmach Institute of Freshwater Biology Polish Academy of Science,
ul. Sławkowska 17, 31-016 Kraków, Poland*

e-mail: wilk@zbw.pan.krakow.pl

pocięcha@zbw.pan.krakow.pl

bucka@zbw.pan.krakow.pl

Abstract.

Interactions between phyto- and zooplankton species have been discussed on the basis of literature data and partially of own, rather general investigations. The ways of taking food by zooplankton was reviewed. The literature data on potential consumers of phytoplankton taxa of a different size is presented in a tabular form. Two aspects of interactions have been analysed: influence of zooplankton on the dynamics and adaptive responses of phytoplankton; phytoplankton as factor stimulating zooplankton development.

Key words: phytoplankton, zooplankton, size relations, interactions, chemical signals.