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## **Controversies around dam reservoirs: benefits, costs and future**

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### **Abstract**

The paper reviews the social and environmental problems concerning the functioning of dams including their local and global effects. Particularly emphasized is a trend toward removing dams in many countries. These are issues of significant importance, particularly in view of the current discussions on justification of investing in new dams, and seeking safe and economical solutions for aging dams, risky in their further operation.

**Key words:** dam building and removal, local and global effects

*„Dams are both a blessing and a curse”*

Dr. Ute Collier

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**Evaluation of the stage of development of the littoral  
of Czorsztyński and Sromowiecki reservoirs  
(Pieniny Mountains, Poland)  
on the basis of analyses of meiobenthos assemblages**

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**Abstract**

The paper presents the degree and directions of the development of the littoral of the Czorsztyński and Sromowiecki dam reservoirs through an analysis of meiobenthos assemblages. The performed research indicates that the two reservoirs reveal a different direction of development. The littoral of the Sromowiecki reservoir has more homogenous characteristics of the group of meiobenthos which can be compared to the groups of artificial ponds. On the other hand, the development of the meiobenthos group of the littoral of the Czorsztyński reservoir is closer to that of natural deep lakes. Sites with silty-sandy sediment lacking visible vegetation remain at an initial stage of development, which due to the composition of major meiobenthic taxa can be compared to morainic reservoirs with a short development history. The performed research indicates the usability of meiobenthos as a bioindex in the monitoring of dam reservoirs.

**Key words:** dam reservoirs, invertebrates, bioindex,

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## Effect of dams on hydrological parameters and the structure of benthic molluscs: case study in Dnieper river basin

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### Abstract

Spatial changes in the structure of benthic mollusk's assemblage were examined in the regulated penepain rivers Psel and Vorskla, Dnieper Basin. Both rivers run within the area of the eastern Ukraine forest-steppe zone. Both rivers are regulated by dams. The sample points were located upstream and downstream the dams.

In the Psel River the high water transparency and current velocity from 80 to 30 km upstream the dam diminished with a distance to the dam. The river length from 30 to 0 km upstream the dam is characterized by the conditions typical for reservoir. Eleven taxa of living mollusks have been traced at the bottom in the riverbed: all taxa found within the section of the river before the reservoir (80-30 km upstream the dam), total density ranged between 175 and 1420. Within the reservoir the number of taxa decreased to 5, density did not exceed 85 ind. m<sup>-2</sup>. Similar trend of mollusks distribution were observed in Vorskla River.

The research showed a detrimental effect of dam on the mollusk fauna. One of the most important effects is the loss of rare and protected species such as *Unio crassus* and *U. pictorum*.

**Key words:** regulated river, reservoir, snail, bivalves, protected species.

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## **Influence of dam reservoir on the water quality in a small upland river**

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### **Abstract.**

The paper deals with the evaluation of functioning of the small dam reservoir localized in a loess agricultural catchment. During the survey, the reservoir had positive impact on water quality in supplying stream – the decrease of majority of the transported contaminants occurred, oxygen indicators were improved. Water flowing into the reservoir was characterized by insufficient quality. Extremely high phosphates concentration was recorded. Also COD<sub>Cr</sub>, BOD<sub>5</sub>, NO<sub>2</sub><sup>-</sup>, and Fe<sup>+</sup> reached high values. In a consequence, a worsening of the stored water quality progressed. The excessive contaminants accumulation (including bottom sediments) and intensification of eutrophication processes greatly reduced the reservoir's usefulness for farming. Rational management and designing of a catchment (e.g. anti-erosion protection) should be one of the important elements at the process of water resources management.

**Key words:** agricultural catchment, water retention, water contamination, protection of water resources

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## **Some issues in the assessment of eutrophication of river waters as a consequence of the construction of a storage reservoir (on the example of the Bystrzyca River)**

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### **Abstract**

The quality and its changes of the Bystrzyca River waters, related to the operation of the reservoir in Zemborzyce (Lublin area), were analysed. In the years 2005-2007, the following eutrophication indicators were analysed in the Bystrzyca River: total nitrogen, total phosphorus, nitrate, and chlorophyll *a* content. In accordance with the flowing waters criteria of the Polish law, the river waters did not show susceptibility to eutrophication or showed advanced water eutrophication. In the case of the criteria applicable to stagnant waters, the river waters showed high eutrophic potential. When constructing a reservoir on a river, water trophic potential based on the standing water criteria should be taken into account.

**Key words:** water quality, nutrients, surface waters

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**Comparison of physical and chemical properties of water  
and floristic diversity of oxbow lakes  
under different levels of human pressure:  
A case study of the lower San River (Poland)**

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**Abstract**

The oxbow lakes of the lower San River are the place where many valuable and protected vascular plants such as *Salvinia natans* and *Trapa natans* can be found. The aim of the research conducted in the San Valley in 2000 and 2004-2005 was to ascertain the relationships between biodiversity and waterbody's local flora but also to examine physical and chemical water parameters and ways of micro-catchment cultivation. The authors also attempted to measure the sensitivity of each of the species to water deterioration. Five oxbow lakes situated in the area around the town of Zaleszany were studied. All of the oxbow lakes came into existence at the same time and only differ in their size and cultivation level. In the case of the San River oxbow lakes there is no direct correlation between macrophyte distribution or presence of threatened and protected species and environmental parameters. It is only considerable human impact that results in macrophyte decrease (expressed as cover index and biodiversity index). The most valuable species i.e. *Salvinia natans* may be threatened by lake overgrowing and excessive eutrophication.

**Key words:** waterbodies, eutrophication, plant cover, protected plant species

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## **The role of catchment and in-lake processes in shaping trophic conditions of the shallow lake Syczyńskie (Eastern Poland).**

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### **Abstract**

Lake Syczyńskie is located in an important border zone between highland and lowland belts. This small and shallow reservoir is exceptional (among Łęczna–Włodawa Lakes) with respect to an extraordinary intensity and seasonal changeability of eutrophication processes. Seasonal changes of ion total loads proved that despite high biogenic compounds supply, there are periods of shortages of phosphorous and nitrogen forms in lake waters. The main territorial factor, which determined ion shortages, was the type of supply and temporally increased water mixing. Eutrophication processes were slowed after many winter thaws, as a result of high ion load outflow, not compensated by loads inflow.

**Key words:** eutrophication, sub-catchments, geogenic elements, nutrients, hydrology

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## **Phytoplankton productivity in littoral adjacent to peat-bog in two limnologically distinct lakes (Łęczyńsko-Włodawskie Lake District)**

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### **Abstract.**

Phytoplankton productivity in peat-bog littoral of two limnologically distinct lakes of Łęczyńsko-Włodawskie Lake District: Piaseczno and Biczce, was studied in summers 2006-2007. Following parameters were determined: phytoplankton primary gross production, chlorophyll *a* concentration, and basic physicochemical factors of waters. Values of biological trophic indices at both lakes did not exceed the level typical for mesotrophy. Achieved results for lake Piaseczno littoral revealed the lack of significant influences of mucked peat-bog on trophic status of waters, as well as non-univocal effects of peat-bog on low productivity of phytoplankton in littoral of eutrophic lake Biczce.

**Key words:** lake, phytoplankton primary production, chlorophyll *a* concentration, eutrophication.

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## **Influence of regulation on ichthyofauna and benthos of the Różanka stream**

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### **Abstract**

The regulation of streams worsen the living conditions of natural communities of water fauna. The aim of the paper was the analysis of the structure of ichthyofauna and macrozoobenthos communities in the regulated part and in the almost natural fragments of the small piedmont stream. In the 1980s the upper section of the stream bed was regulated. Five sampling sites were chosen with the different degree of anthropogenic changes. The regulation of the stream decreased the variety of the habitats. Such changes led to the almost complete disappearance of fish in the regulated part of the stream. The density of invertebrates in the natural sites amounted from about 16.5 thousand to almost 30 thousand organisms per 1 m<sup>2</sup> in site 4 while in the regulated sites the density was about 10.5 thousand in site 2. In the community of benthos in sites 1 and 2 dipterans dominated. The general density of stoneflies was the smallest in site 1. Most of the mayflies were indicated in the natural sites 4 and 5. The caddisflies were mostly congested in site 4. *Gammarus* was the most numerous and had the biggest biomass in the natural sites. The ichthyofauna in the regulated sites consisted of only 3 species: gudgeon, chub and minnow. In site 1 only gudgeon was caught. However, the total of 12 species were found in the natural sections. Density of ichthyofauna on the regulated sites amounted to from 1 to 6 individuals per 100 m<sup>2</sup>. Whereas, on the natural sites the density was 126 indiv. 100 m<sup>-2</sup> (site 4) and 116 indiv. 100 m<sup>-2</sup> (site 5). Gudgeon was most abundantly represented in site 4. In the biomass chub prevailed. Chub was also dominant in the biomass in site 5, but the bleak was the most numerous. The key findings of our research confirm that the regulation of the Różanka stream led to almost complete disappearance of fish despite quite clean water and a lot of potential food.

**Key words:** fish, piedmont stream, human – modified rivers

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## **Bacterioplankton of the Warta River in relation to physicochemical parameters and flow rate**

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### **Abstract**

Abundance and biomass of bacterioplankton were studied in the middle section of the lowland Warta River (Wielkopolska Lake District, Poland) from May to December 2009 in relation to environmental parameters, nutrient concentrations, and flow rate. The abundance of planktonic non-phototrophic bacteria ranged from  $2.1 \cdot 10^6$  to  $10.6 \cdot 10^6$  cells  $\text{cm}^{-3}$ , while phototrophic from  $0.8 \cdot 10^3$  to  $5.1 \cdot 10^5$  cells  $\text{cm}^{-3}$ , and both showed maximum in July. Phototrophic bacteria were dominated by cells  $>2 \mu\text{m}$  and showed greater variability among sampling dates than non-phototrophic bacteria, which were dominated by cells  $<2 \mu\text{m}$ . Total abundance of bacterioplankton was significantly correlated with 9 parameters. Two of the correlations were significant at  $p \leq 0.001$  (total organic carbon, total suspended solids), and two at  $0.01 \geq p > 0.001$  (temperature, particulate organic carbon). Five correlations were significant at  $0.05 \geq p > 0.01$  (dissolved oxygen, biochemical oxygen demand, total phosphorus, electric conductivity, chlorophyll *a* concentration). No correlation was found between abundance of bacterioplankton and water flow. Bacterial dynamics in the Warta River is influenced by a cyanobacterial bloom in a reservoir located upstream from the studied section of the river.

**Key words:** phototrophic bacteria, non-phototrophic bacteria, water quality, lowland river, water level

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## Changes in structure of macrophyte communities in the chosen lakes of Łęczna–Włodawa Lake District

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### Abstract

Changes in the aquatic vegetation structure were analyzed in 4 lakes of Łęczyńsko-Włodawskie Lake District. The macrophytes' structure has changed quite essentially in lakes in the last 10 years. A tendency of reduction the number of plant associations was observed in meso- and slightly eutrophic lakes, while an increase was observed in eutrophic ones. The range of macrophytes occurrence decreased in all investigated lakes.

At first, phytocenoses of submerged macrophytes retreated from the lakes, especially charophyte communities. However, the number of phytocenoses of the rush vegetation grew up. The increase in *Phragmitetum australis* occurrence, was observed in each investigated lake. It is the typical phenomenon connected with successional changes in vegetation from mesotrophic to eutrophic lakes.

**Key words:** macrophytes, spatial structure, transformation of plant associations, lakes, stoneworts

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## Crustacean plankton of restored Lake Starodworskie.

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### Abstract

Lake Starodworskie is a reservoir restored since the 1960s, first through artificial aeration and in the 1990s by the method of phosphorus inactivation. Studies of zooplankton were conducted in 2007-2008. The aim of the present research was to analyze and evaluate the taxonomic structure and overall abundance of the crustacean plankton of the lake. The eudominant species found were: *Bosmina longirostris* and *Daphnia cucullata*, while the dominant species included: *Eudiaptomus graciloides*, *Diaphanosoma brachyurum* and *Mesocyclops leuckarti*. The average annual density of Crustacea in the reservoir amounted to 329 indiv. dm<sup>-3</sup>, while the average biomass reached 5.1 mg dm<sup>-3</sup>. The abundance of indicatory species typical for eutrophic waters was smaller than recorded during previous zooplankton studies of Lake Starodworskie (average densities were: *M. leuckarti* – 12 indiv dm<sup>-3</sup>, *T. oithonoides* – 4 indiv dm<sup>-3</sup>, *D. brachyurum* – 14 indiv dm<sup>-3</sup>, *B. longirostris* - 92 indiv dm<sup>-3</sup>). The overall abundance of the zooplankton and its structure suggest moderate eutrophy of the reservoir.

**Key words:** zooplankton, lake, restoration, trophic status

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## Epiphytic fauna inhabiting *Stratiotes aloides* in a new lake of the Słowiński National Park (Smółdzińskie lake, Poland)

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### Abstract

Qualitative and quantitative structure of phytophilous macrofauna inhabiting *Stratiotes aloides* L. have been studied in a newly formed Smółdzińskie Lake in the area of the Słowiński National Park during vegetation period (V-IX) in year 2008. Jointly 27 taxa inhabiting the studied plant species were identified and their number varied in time. The highest amount of epiphytic fauna taxa was observed in June (22) and September (20) while the lowest in August (13). The quality of lake waters significantly influenced both density and biomass of fauna inhabiting and mining the leaves of water soldiers. On the basis of qualitative and quantitative structure of epiphytic fauna, the quality of lake waters was assessed, which- according to BMWP-PL index- corresponded to class III. The analyses of benthofauna inhabiting pleustonic vegetation, as a part of biomonitoring, seem to complete the ecological assessment of aquatic ecosystems.

**Key words:** phytomacrofauna, abundance dynamics, ordinations, reservoir

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## **The usefulness of various indices in the assessment of water quality of a lowland river**

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### **Abstract**

In the studies carried out at the upper stretch of the Liwiec River (the Bug River tributary) the following aspects were analyzed: chosen chemical parameters of water, the content of N, P and C<sub>org</sub> in bottom sediments, the taxonomic composition of invertebrate macrofauna, the taxonomic composition of macrophytes and the coverage of the bottom with hydrophytes. Chemical and biological water quality assessment (BMWP-PL and MIR indices) was performed. Correlations between chosen chemical water parameters and bottom sediments parameters and the values of biological indices were established. Our results confirmed that the macrophyte index is an appropriate indicator for assessing the degree of river eutrophication. It seems that the values of MIR index used to assess water quality of a lowland river should be revised. Thus, the index based on macroinvertebrates is currently more suitable for the assessment of a lowland river water quality.

**Key words:** chemical parameters, biotic index BMWP-PL, macrophyte index MIR, water quality, bottom sediment

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## **The attempt of evaluation of chosen lakes from Łęczna-Włodawa Lakeland using E. Bajkiewicz-Grabowska method.**

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### **Abstract**

E. Bajkiewicz-Grabowska method, basing on evaluation both the drainage area as matter supplier and lake resistance to degradation, has been used to assess five differing lakes from Łęczna-Włodawa Lakeland. The Krasne Lake and the Rogoźno Lake have been classified as first type – parameters of lakes and their drainage areas are not favourable for degradation. The second type – lake is resistant with the catchment having great ability to supply the reservoir with matter - was not represented by any of the selected lakes. The Rotcze Lake has been ranked as the third type – lake is not resistant but the drainage area is not active as matter supplier – pace of eutrophication is moderate but any interference in drainage area condition can lead to an increase in its rate. Two lakes Kleszczów and Miejskie have been classified as the fourth type – lakes show great dependence on external factors and the catchment has a great ability to supply the reservoir with matter – the eutrophication is fast.

The method can then be applied to assess lakes and their basins independently from their genesis, water trophy, water characteristics, lake and basin morphometry and catchment land use structure, geology or geographical location.

**Key words:** lake resistance, eutrophication ability, drainage-lake system

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## **Possibilities of protection of water resources with the use of constructed wetland systems: a review**

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### **Abstract**

This paper presents a review of information about the method of sewage purification by constructed wetland systems (CWs) and the results of the efficiency of pollution removal in such systems. Data from various countries of the world indicate that single-stage CWs are characterised by a fairly high, above 80%, efficiency of removal of total suspended solids and reduction of BOD<sub>5</sub> and COD, but lower efficiency of removing biogenic compounds – below 50%. Significantly higher efficiency of removing pollutants can be achieved with the use of multi-stage hybrid CWs whose efficiency in total nitrogen removal is from 61 to 86%, and of total phosphorus 70–99%. The results obtained indicate that the application of CWs may provide effective protection of water resources against pollution.

**Key words:** environment protection, TSS, BOD<sub>5</sub>, COD, TN, TP, pollution removal, willow, reed

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## **Preliminary results of studies on the purification of water in a pond using the SCD Probiotics technology**

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### **Abstract.**

The paper presents preliminary results of a study on the application of the SCD Probiotics Technology to improve surface water quality. The Technology is based on the principles of the effective microorganism (EM) technology developed in Japan over thirty years ago by Dr Teuro Higa. The study was carried out in 2006-2008 in a pond with an area of 1200 m<sup>2</sup>, receiving purified sewage discharged from a constructed wetland system with willow vegetation filter, in operation since 1994, to which the SCD Probiotics Technology was applied since September 2007 till June 2008. A decrease of biogenes concentrations in the pond water was recorded after applying the tested technology – ammonium nitrate concentration decreased by 85.2%, total nitrogen by 56.9%, while total phosphorus by 77.6%. Chlorophyll *a* level also showed a decreasing tendency. However, more detailed studies are still required to confirm the effectiveness of the SCD Probiotics technology in the purification of surface water.

**Keywords:** surface water quality, biogenes concentration, effective microorganisms,

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## Zoobenthic assemblages of ponds supplied with biologically treated sewage

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### Abstract

The composition of benthic macroinvertebrate communities were studied in three interconnected earth fish ponds in the sewage treatment plant in Olsztynek. These ponds were fed with biologically treated wastewater and stocked with the common carp (*Cyprinus carpio* L.), tench (*Tinca tinca* L.), European pike-perch (*Sander lucioperca* (L.)) and roach (*Rutilus rutilus* L.). Zoobenthos was sampled monthly between April and October 2007. The dominant taxa were Chironomidae and Oligochaeta. Ceratopogonidae and Ephemeroptera were scarce. Taxon richness was low. The total densities of bottom fauna of ponds varied from 3060 ind. m<sup>-2</sup> to 9928 ind. m<sup>-2</sup> in pond 1 and 2, respectively. Abundance of the total zoobenthos of three ponds showed similar temporal patterns with a peak in mid summer and a minimum in early spring and fall. The fauna of ponds were partially similar and indicated high trophy and impact of fish. The presence of underground springs at the bottom of ponds no. 2 and 3 probably affected the composition of aquatic macroinvertebrate communities.

**Key words:** pond, zoobenthos, wastewater supply

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