

Fish fauna and the exotic species *Micropterus salmoides* in the floodplain wetlands (Woopo and Junam) of the Nakdong River in S. Korea*

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Abstract

The Woopo Wetland (Ramsar site) and Junam Reservoir are ecologically important floodplain wetlands in the lower Nakdong River (total length: 525 km). The ichthyofauna of the riverine wetlands was investigated during 1999-2001. In Woopo and Junam, a total of 17 and 14 freshwater fish species were collected respectively, while about 25 species occurred in the nearby main channels. These comprised only about 50% of the species found in previous studies. (Woopo: '83-'96, 29 species; Junam: '87-'98, 29 species). The causes are believed to be the proliferation of the exotic species (Woopo RA 60.5%, Junam RA 41.6%; *Micropterus salmoides*, *Lepomis macrochirus* and *Carassius cuvieri*) and the physico-chemical alteration of the river because of the construction of an estuarine dam in 1987. Dietary analysis of *M. salmoides* at both wetlands indicated that native Cyprinidae, the dominant family in S. Korea, was the most abundant fish in stomach contents (n=41). *Micropterus salmoides* populations were proliferated to be important predator in both wetlands. They seemed not to have specific choice of prey fish species but just have a preference for fish. In both wetland systems, the complete food web structure needs to be examined to understand long-term impacts of proliferation of exotic species and the effects of the dam on the native fauna.

Key words: floodplain wetland; exotic species; *Micropterus salmoides*

Transport of passive admixture in a multi-channel river system - the Upper Narew case study. Part 1. Hydrological survey

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Abstract

This paper presents information required for conducting tracer test to study transport of passive admixture in a multi-channel Upper Narew River system. A precondition for a proper understanding of the physical processes governing the transport of pollutants in a river is a detailed recognition of hydrological and morphometric state within the river channel. This paper examines these conditions within a part of the river connecting Suraż and Bokiny constituting the opening river reach within the Narew National Park. Brief descriptions are given of study area and channel network at the time of field experiment. Then overview of the flow field and hydrological, hydraulic and topographic characteristics are presented. This is the first study of that kind in this unique anastomosing river system allowing for the detailed understanding of the flow regime in this highly complicated hydrographic network.

Keywords: Anastomosing river, channel pattern, river flow, mean velocity field

Transport of passive admixture in a multi-channel river system - the Upper Narew case study. Part 2. Application of dye tracer method

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Abstract

The paper presents information related to conducted tracer test to study hydraulic transport in unique multi-channel Narew river system. The motivation of the experiment was the evaluation of the threats to the Narew National Park by an accidental release of the pollutants at the upstream locations. The study is concerned with one-dimensional longitudinal transport of the dye described by means of so-called dead-zone model. It is shown that the temporary storage of the admixture plays a crucial role in the analyses of the pattern of its spread in the multi-thread river system. A special procedure based on the frequency response function and the reverse Fourier transform was elaborated for the identification of respective storage-zone parameters and the dispersion coefficients. Despite high complexity of the river system under consideration good agreement between modeling and experimental results has been attained.

Keywords: anastomosing river, tracer test, longitudinal dispersion, dead-zone model, passive pollutant

Effect of Paraquat on freshwater zooplankton and zoobenthic assemblages in enclosure experiments.

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Abstract

This study analyzed the effects of the herbicide Paraquat on zooplankton and zoobenthic assemblages and their capacity to recover. The herbicide caused a decrease in the abundance and biomass of larger-sized individuals (cladocerans, adult copepods and molluscs). The zoobenthos assemblage required a longer time to recover its structure than the zooplankton one. The number of zooplankton species was less affected than their density, in contrast to the benthos. The benthos and zooplankton species associations diminished considerably and the composition of the survivors determined the outcome of secondary succession.

Key words: ecotoxicology, herbicide, mesocosms, freshwater communities, recovery.

Seasonal dynamics of macroinvertebrates associated with submersed macrophytes in a lowland river downstream of a dam reservoir

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Abstract

Two species of *Potamogeton* (*filiformis* and *lucens*) with contrasting leaf morphology, appeared in the Warta River as the consequence of water management – low volume discharges through the dam reservoir in summer. A similar sequence of invertebrate taxa as colonizers was observed over two cycles, *Hydra* sp. being initially the dominant. In spite of a similar pattern of colonization of two macrophyte species, *P. filiformis* and *P. lucens*, the density of invertebrates was higher on the first one; this may be an effect of larger surface of the leaves of the first species. Chironomidae dominated, especially scrapers (*Cricotopus* as epiphyton consumers) and, in decreasing order, predators (*P. arcuatus*) and filtering collectors (*Tanytarsus* sp.).

Key words: river, tailwater, submerged macrophytes, chlorophyll *a*, epiphytic fauna

Influence of environmental factors on production of stoneflies (Plecoptera) from the Hincov brook (High Tatra, Slovakia)

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Abstract

Life cycle and larval production was studied in 10 mountain stonefly species (*Protonemura montana*, *P. nimborum*, *Leuctra armata*, *L. autumnalis*, *L. pusilla*, *Capnia vidua*, *Siphonoperla neglecta*, *Diura bicaudata*, *Isoperla sudetica* and *Perlodes intricatus*). The daily growth attains 1.2 – 2.4 mg (per 100 mg of larval dry weight), stoneflies achieve relatively high production (980.4 mg DW year⁻¹ m⁻²) and play a dominant role in zoobenthos. Seasonal production of detritivorous stoneflies depends on coarse benthic organic matter and on the amount of moss, which creates suitable environment for them. Seasonal production of predatory species is influenced by the production of non-carnivorous macrozoobenthos and water temperatures. High production occurred during the colder period, when relatively abundant population of brown trout, did not feed actively.

Key words: stonefly taxocoenose, life cycles, daily growth, organic matter, moss, macrozoobenthos, trout predation, food guilds, mountainous stream.

A N₂-fixing rice-field cyanobacterial mutant resistant against uracil herbicide

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Abstract

The herbicide isocil (5-bromo-3-isopropyl-6-methyluracil), a superseded compound, has been found inhibitory to growth (in N-free or 5 mM NO₃⁻ medium) and heterocyst formation (in N-free medium) of the N₂-fixing wetland rice paddy field cyanobacterium *Nostoc muscorum* at a dose of 400 – 800 µM for 15 min. Inhibition was reversed on exogenous supplementation of growth medium with 3.0 mM glucose and/or 5.0 µM NADPH₂. A spontaneous 4 mM isocil-resistant mutant of this organism has been selected in N-free medium. This mutant shows better growth than the parental strain in both N-free and NO₃⁻ media, as well as higher heterocyst frequency and nitrogenase activity in N-free medium. The resistance factor (determined by dividing the LD₅₀ value of the mutant by that obtained for the parental strain) is nearly 100. The mutant has a simultaneous cross-resistance to 10 µM DCMU [3-(3,4-dichlorophenyl)-1,1-dimethylurea]. The resistance of this mutant against herbicides, affecting the photosynthetic electron transport chain, in *N. muscorum* in N-free or NO₃⁻ medium makes this cyanobacterial strain valuable in herbicide-treated wetland rice paddy fields because of its unimpaired growth and efficient nitrogen fixation. Such strains could be potent candidates for use as natural biofertilizer in rice agriculture and nutrient cycling in rice-field ecosystem.

Key words: Cyanobacterium, *Nostoc muscorum*, herbicide, uracil, mutation, nitrogen fixation

Joint occurrence of cyanobacteria and zoosporic fungi in water of various origin in laboratory conditions

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Abstract

The influence of the cyanobacteria *Anabaena contorta* Bachm., *Anabaena spiroides* Klebahn and *Microcystis aeruginosa* Kütz. em Elenk. on the occurrence of aquatic zoosporic fungi in the water from seven water bodies of different trophic status was investigated in laboratory conditions. In all cases presence of cyanobacteria reduced the number of fungi species. The effect of cells of the same species of cyanobacteria on zoosporic fungi differed in water of different origin. Thirteen species of zoosporic fungi new for the Polish flora water were found both in control and in samples with cyanobacteria.

Key words: Oomycetes, *Anabaena*, *Microcystis*, hydrochemistry

Hyphomycetes of a deep, oligo-mesotrophic Lake Hańcza (North East Poland)

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Abstract

Quantitative analysis of occurrence of Hyphomycetes flora in relation to environmental factors in Lake Hańcza was done during three-years (1996-1999). Buckwheat – seeds, hemp – seeds, cellophane and snake exuviae were used as baits during the exposure in the laboratory. Fifty five hyphomycete species were found, 8 of the were new for Poland. In the whole study period, water samples collected in summer contained the fewest mitosporic fungi. Data obtained for Lake Hańcza basing on the similarity of the parameters examined in the respective years indicate that the number of hyphomycete species is in each case related to a different hydrochemical parameters.

Key words: Ingoldian fungi, Lake Hańcza, hydrochemistry

Metabolic activity of salicylic acid in *Wolffia arrhiza* (L.) Wimm. growing in different trophical conditions

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Abstract

The *Wolffia arrhiza* (L.) Wimm. (*Lemnaceae*), a photoautotrophic organism, was grown in tap water of Bialystok (rich in basic mineral but poor in organic components) under influence of salicylic acid (SA). The growth was found to be strongest stimulated in concentration of SA 10^{-6} M. An intensive growth of the contents of nucleic acids: DNA and RNA (185–225%), reducing sugars (150–208%), chlorophylls (*a* + *b*), total carotenoids (144–145%) and net efficiency of photosynthesis (135–155%) in comparison with the control culture devoid of exogenous SA (100%) was observed. However, the contents of water-soluble proteins decreased to the level of 25–56% in regard to the control culture treated as 100%.

The *W. arrhiza* growing on municipal sewage from Bialystok, including two times more mineral elements and twenty times more organic substances in comparison to urban water, switched to mixotrophism, probably with dominance of heterotrophism over photosynthesis. Under the influence of 10^{-6} M SA, the most intensively stimulated physiological parameters was the content of nucleic acids: DNA and RNA (maximally up to 208%), water-soluble proteins (147–154%), reducing sugars (172–185%) and next the contents of chlorophylls *a* and *b* were on the same level with the control group, while contents of total carotenoids increased only to 111% in regard to control group (100%). However, net photosynthesis rate decreased to the level of 68–70% in comparison with the control culture (100%).

Key words: *Wolffia arrhiza*, salicylic acid (SA), growth, water-soluble proteins, reducing sugars, nucleic acid (DNA and RNA), net photosynthesis rate, chlorophylls (*a* + *b*), total carotenoids.