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## Natural risks: mitigation and adaptation

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### Abstract

Increase of human impact on the environment entailed increase of the numbers of natural disasters and related economic and human losses in last decades. Climate projections suggest further intensification of risks. At the same time, the growth of welfare in many countries, including Poland, increases loss potential. Although Poland is not particularly endangered, as compared to some other countries, such as Japan, natural risks occur. In several cases (for instance, the floods in 1997 and in 2010) losses reached the level of billions. Expected increase of risks calls for strengthening of the preparedness system. Two approaches are possible: mitigation (eliminating the sources of risks) and adaptation (accepting inevitability of losses and trying to reduce the loss). The knowledge on these two approaches is limited. Nevertheless, the traditional approach, relying on structural protection is clearly insufficient.

**Key words:** natural risks, climate change, adaptation, mitigation, disasters.

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## **From research to operational biomonitoring of freshwaters: a suggested conceptual framework and practical solutions**

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### **Abstract**

To contribute to solving the dilemma of the conflicting needs of water managers and ecologists, we are proposing an approach for the use and development of existing biomonitoring tools. For running waters, a harmonization system allows to use a set of various biotic indices. Functional traits are regarded as a basis for assessing ecological functioning. They take into account the dynamics of water exchanges between surface water and groundwater. In lakes, the oligochaete index IOBL describes the metabolic potential of deep-water sediments. Coupled with percent pollution-sensitive oligochaete species, it allows to define a typology of lake sediments. The presented tools are integrated through a conceptual framework, including research management and technology transfer procedures.

**Key words:** running and stagnant waters, ecohydrology, biological methodologies.

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## **Determining the ecohydrological character of aquatic refugia in a dryland river system: the importance of temporal scale**

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### **Abstract**

Aquatic refugia are important features of riverine landscapes; providing habitat for biota during extremes and facilitating the recovery of biota from disturbance. The persistence and quality of aquatic refugia is intricately linked to the hydrological regime of their parent rivers. Knowledge of the influence of hydrology on refugia is essential for understanding their role in the functioning of riverine ecosystems. A hierarchical framework is used to investigate the hydrological character of refugial waterholes in a dryland river system at multiple temporal scales. The study demonstrates that temporal variability is matched by a high level of spatial variability in hydrological character and that spatial patterns in hydrological character varied according to the temporal scale at which hydrological characterisation was made. The findings of this study have important implications for dryland river ecosystems because of the fundamental importance of hydrology as a driver of riverine ecosystems.

Key words: ecohydrology, refugial waterholes, hierarchical framework, dryland rivers.

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## **Two different feeding tactics of young-of-the-year perch, *Perca fluviatilis* L., inhabiting the littoral zone of the lowland Sulejow Reservoir (Central Poland)**

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### **Abstract**

The feeding pattern of young-of-the-year (YOY) fish was investigated in a field experiment in the sparsely vegetated littoral zone of the Sulejow Reservoir in June 2007. Perch received special emphasis in this study. During the study period, the part of the reservoir selected to conduct the research was densely inhabited by YOY fish (up to 20 individuals per square metre). The dominant YOY species were perch (*Perca fluviatilis*) and roach (*Rutilus rutilus*). Analyses of stomach/gut contents showed that large zooplankters and benthic prey contributed significantly to the diet of YOY fish. For perch, two distinct feeding tactics were observed. Fish collected by trapping in unvegetated gaps among beds of macrophytes preyed almost exclusively on daphnids and copepods, whereas individuals seined in shallow water among macrophytes ate mostly the larvae of benthic insects. The observed division of YOY perch into two feeding groups may indicate an attempt to decrease the level of both intra-specific competition among the cohort's members and inter-specific competition between perch and roach.

**Key words:** juvenile fish, littoral, feeding behaviour, zooplankton.

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## **Immatures of Chironomidae (Insecta – Diptera) under the action of pesticides in irrigated rice field**

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### **Abstract**

We collected 589 larvae distributed among a control treatment and seven pesticide treatments (Only®, Imazethapyr, Imazapic, Clomazone, Quinclorac, Carbofuran and Fipronil). The most abundant genera were *Kiefferulus* spp., *Chironomus* spp. and *Dicrotendipes* spp. ANOVA showed a significant difference ( $p < 0.05$ ) in the density of Chironomidae larvae in the first sample between the Fipronil and control treatments. ANOSIM also showed variation in the Chironomidae community composition and trophic groups. The PRC analysis showed that the pesticide concentration was higher on the first 10 days after its application. The pesticides used in the rice crop had an initial negative effect to the Chironomidae community, dissipating during the development of the crop.

**Key words:** macroinvertebrates, pesticides, irrigated rice, biomonitoring.

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## Zooplankton community emerging from fresh and saline wetlands

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### Abstract

Salinity is a significant factor affecting aquatic species distribution and diversity. To quantify the impact of increasing salinity on the zooplankton community structure, the emergence of zooplankton community from fresh and saline wetlands under different salinity was examined. Sediments from three wetlands from the Upper South East of South Australia were exposed to salinity levels of 300 mg dm<sup>-3</sup>, 5000 mg dm<sup>-3</sup> and 15 000 mg dm<sup>-3</sup> for 21 days. After 21 days, more taxa had emerged from fresher wetland sediment than emerged from more saline wetlands. A reduction in the number of zooplankton species and their abundance was evident in the freshwater wetland sediment once salinity was increased from 300 mg dm<sup>-3</sup> to 5000 mg dm<sup>-3</sup>. Species that emerged from freshwater sediment were mainly freshwater species and their number was significantly reduced as salinity increased. Saline wetlands were colonised by more salt tolerant species such as *Brachionus plicatilis*, *Trichocerca* sp. and calanoid copepods. The results indicate that increasing salinity will potentially reduce freshwater zooplankton richness and the community will be shifted from freshwater species to more salt tolerant species.

**Key words:** zooplankton, eggs, salinity, wetlands.

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## Ecological and biological aspects of fish assemblage in the Chybayish marsh, Southern Iraq

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### Abstract

The characteristic of fish assemblage in the restored Chybayish marsh was described in the time of 3 years after restoration. As much as 14 species were caught from October 2005 to September 2006. Detritivorous species, *Liza abu* was the most abundant species, followed by *Carassius auratus* and *Barbus luteus*. Fish species diversity indices were lower than in other restored southern marshes which may reflect the still degraded environment of the marsh and decreased productivity of vegetation. Diets varied among fishes. Most of them depended on two or three major foods, and five principal pathways of energy flow in the food web. Currently, restoration by reflooding of drained marshes is proceeding and the ecological effects of this massive water diversion needs elaborated research. Some solutions to retain water in the marsh even in the unfavorable climatic conditions have been suggested.

**Key words:** Species compositions, alien species, diversity indices, food habits, Mesopotamia wetlands.

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## **Biofuel production from water hyacinth in the Pantanal wetland**

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### **Abstract**

The Pantanal is a major wetland in the inner South America, with the potential for production of large quantities of biomass of aquatic floating species, especially water hyacinth (*Eicchornia crassipes* and *E. azurea*), during the aquatic phase of the flood pulse characteristic for this ecosystem. Such biomass could be wisely managed for the production of biofuels. This should be based on the concepts of renewability and ecosystem surplus, and could help in neutralizing of regional and global industrial carbon impacts and to induce socioeconomic development. The aquatic biomass exploitation would require low fossil energy and materials inputs, leaving a positive energy balance, with minimal interference in the environment. This emerging biofuel-based economy in the Pantanal can be a good example of human adaptation to climatic changes by managing carbon export of natural wetlands. The concepts described herein could be used in other natural, restored or artificially constructed wetlands.

**Key words:** bioenergy, aquatic biomass, climatic change, ecosystem surplus, renewability.

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