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EFFECT OF HEATED-WATER DISCHARGE ON THE FUNCTIONING OF LAKES

To the memory of the Late Prof. dr hab. Janusz Zawisza who had been the inspirator and coordinator of the research projects presented in this volume.

PREFACE

Thirty years ago (1958) the waters of the first two lakes of a picturesque lakeland Ślesin-Gopło were linked up with the operation of the first Konin power plant using regional lignite deposits. About a dozen years later (1970), as a result of the starting of the operation of another power plant, all the five lakes of the lakeland with a joint water volume of about 61 million m^3 became a large system for cooling their own waters taken up by both power plants at a rate of up to 7 million m^3 per day in summer. A series of canals and spillways have changed the system of lakes, originally separate and not interconnected, into a complex of water bodies where several intertwined "hot streams" circulate. Since that time they have commonly been called the "Konin lakes".

For limnologists and ichthyologists a unique object for study has arisen: three shallow and two deep typically temperate, lowland lakes have changed their basic thermal and mictic status in a permanent way and have become through-flow, turbulent, subtropical lake ecosystems with occasional ice covers in winter. At the very beginning of the existence of the cooling system the comprehensive studies on environment and ichthyofauna of some of the lakes were started by the Inland Fisheries Institute. In later years there was a close cooperation in this area of institutions like University of Poznań, Institute of Ecology of Polish Academy of Sciences, Institute of Environment Management, and other organizations. Owing to the fact that from the very beginning similar study methods have been used, the series of data on the Konin lakes is the longest in the current world literature, for it depicts changes over a period as long as nearly three decades!

The aim of the studies, their objectives and philosophy varied. For example, there have been studies of productivity (primary and secondary productivity, as well as fishery, i.e., the "final" lake production) taking advantage of the formation of an

ecosystem with permanently changed thermal conditions, that is, the factor that unequivocally determines the production of biomass in every link of the food chain. There have also been studies to provide a scientific basis for fishery management in heated waters with great hopes for a successful introduction of exotic fish species. However, they have proved whimsical and caused "environmental problems" (e.g. the grass carp). Finally, the current ecological studies of the Konin lakes can be called an ecological monitoring of environmental changes brought about by the heat- and power-generating industry.

In this volume containing a series of 14 papers a synthesis has been presented of most of the fundamental limnological studies that have been conducted on the Konin lakes throughout the period of their functioning as an open through-flow cooling system of two lignite-based power plants. Against an outline of the current understanding of the impact of warm waters on natural lakes the unique importance has been stressed of the 30 years' period of researches on the Konin lakes (A. Hillbricht-Ilkowska and B. Zdanowski). It has been pointed that the effect of heated-water discharge and the operation of power plants is not limited to changes in the thermal regime, which is rather of little importance in the case of temperate-zone lakes. But it entails an overwhelming impact of changes in the mictic state and water turbulence, synergic effects of various kinds of pollution associated with the functioning of the power plants, as well as the coincidence of various fishery operations and secondary effects of changes in the fish-stock itself and in the behaviour of fish (A. Hillbricht-Ilkowska and B. Zdanowski; H. Wilkońska). Presented in the particular papers of the volume are long-term tendencies of changes in the trophic and habitat conditions (B. Zdanowski, A. Korycka and A. Gębicka), as well as in primary productivity (B. Zdanowski), including that of the phytoplankton (A. T. Simm), and in secondary productivity, including that of the zooplankton (A. Hillbricht-Ilkowska, J. Ejsmont-Karabin and T. Węgleńska) and fish (H. Wilkońska). Analyses have also been made of habitat and biocoenose spatial variation in various parts of the circulating "hot river", that is, at heated-water discharge sites (A. Hillbricht-Ilkowska and A. T. Simm; A. T. Simm; J. Ejsmont-Karabin and T. Węgleńska; A. Stańczykowska, K. Lewandowski and J. Ejsmont-Karabin). Power-plant function as that of a selective predator has been assessed also (J. Tunowski).

After submitting this volume to the publisher for printing the authors will ask themselves the question what will be the fate of the Konin lakes in future, what are the prospects for the next 30 years? Some considerations concerning this subject can be found in the first several papers. Ecological monitoring studies of the Konin lakes are being continued. Special measures of their conservation and protection are taken into account.

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