

ENVIRONMENTAL CONDITIONS IN A SHALLOW, URBAN LAKE, RESTORED BY PHOSPHORUS INACTIVATION METHOD

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Location of Lake Mielenko in Poland and Europe

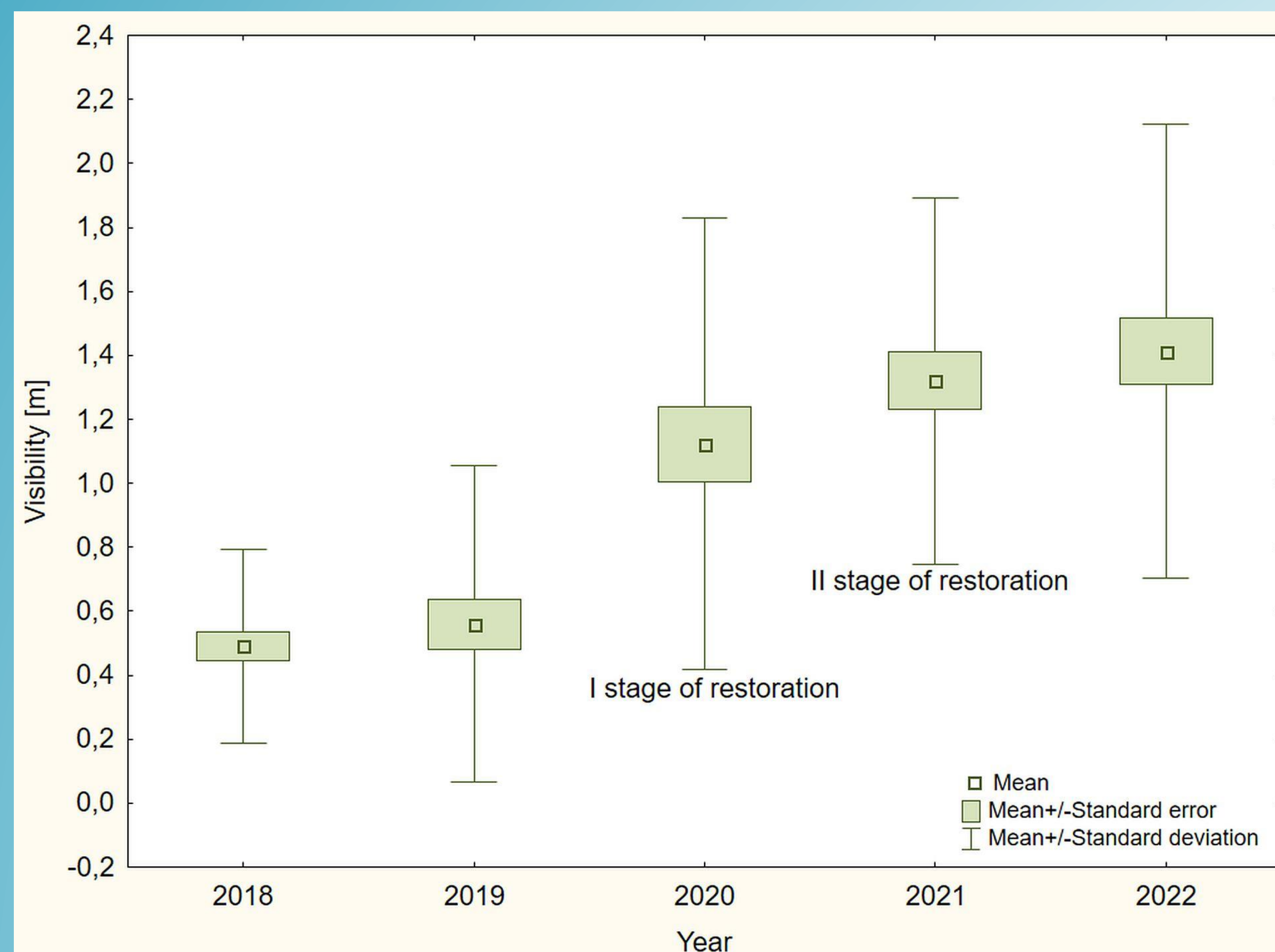


Lake Mielenko (Fot. Jolanta Grochowska)

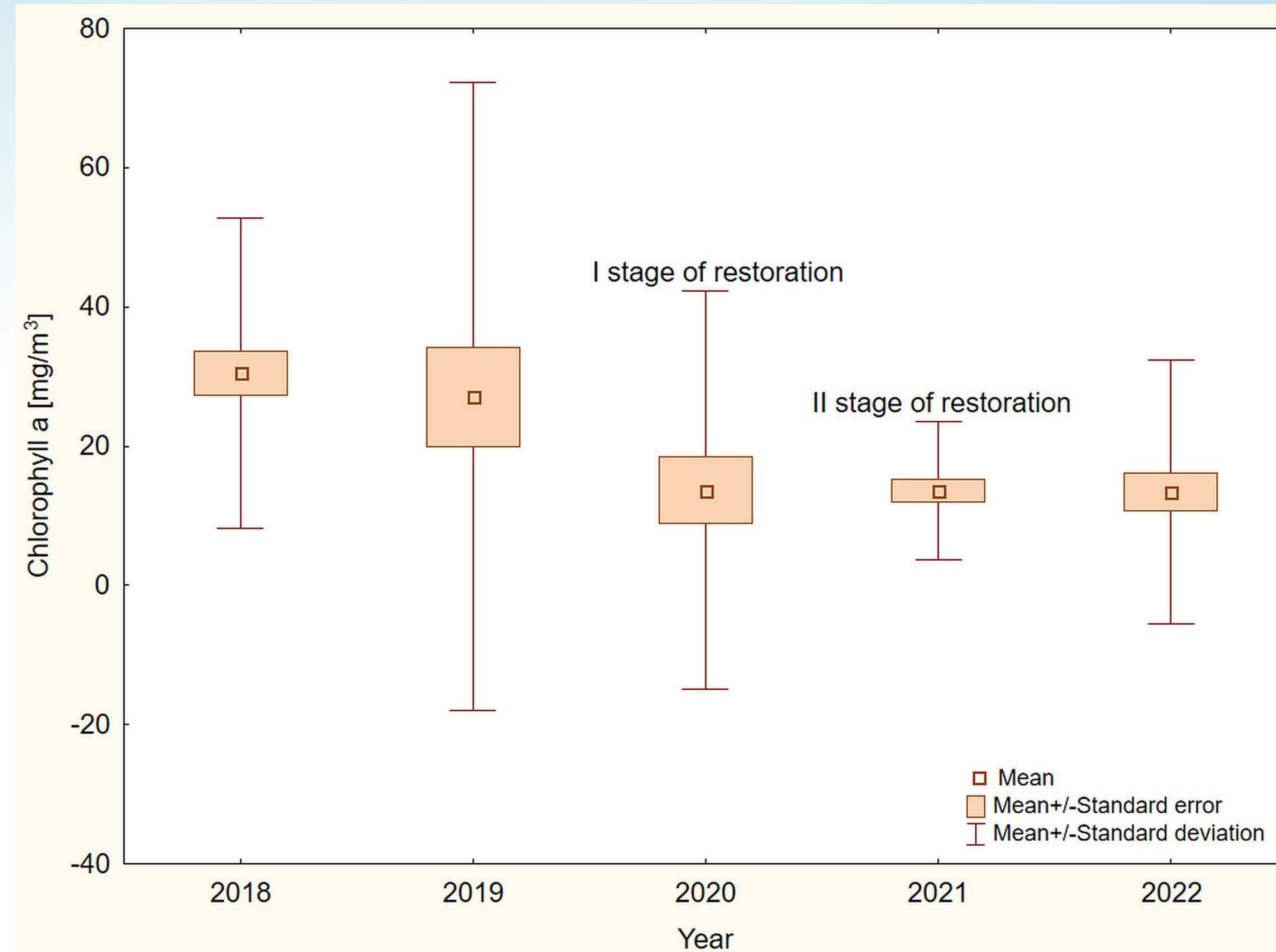


The rapid acceleration of lake eutrophication, which was related to human activities, forced to seek effective methods of this process inhibiting or reversing and its adverse consequences. In order to improve the quality of lake water in Poland and around the world the restoration treatments (technical, biological) were developed, which cause permanent nutrients immobilization in the sediments or the removal of its excess beyond a lake ecosystem. One of the most effective and cheap methods of lake restoration is the chemical inactivation of PO_4 with Fe, Al, Ca or Mg salts. The method of phosphorus inactivation uses the fact that PO_4 compounds are quite sparingly soluble, which allows them to be precipitated from water and deposited in bottom sediments.

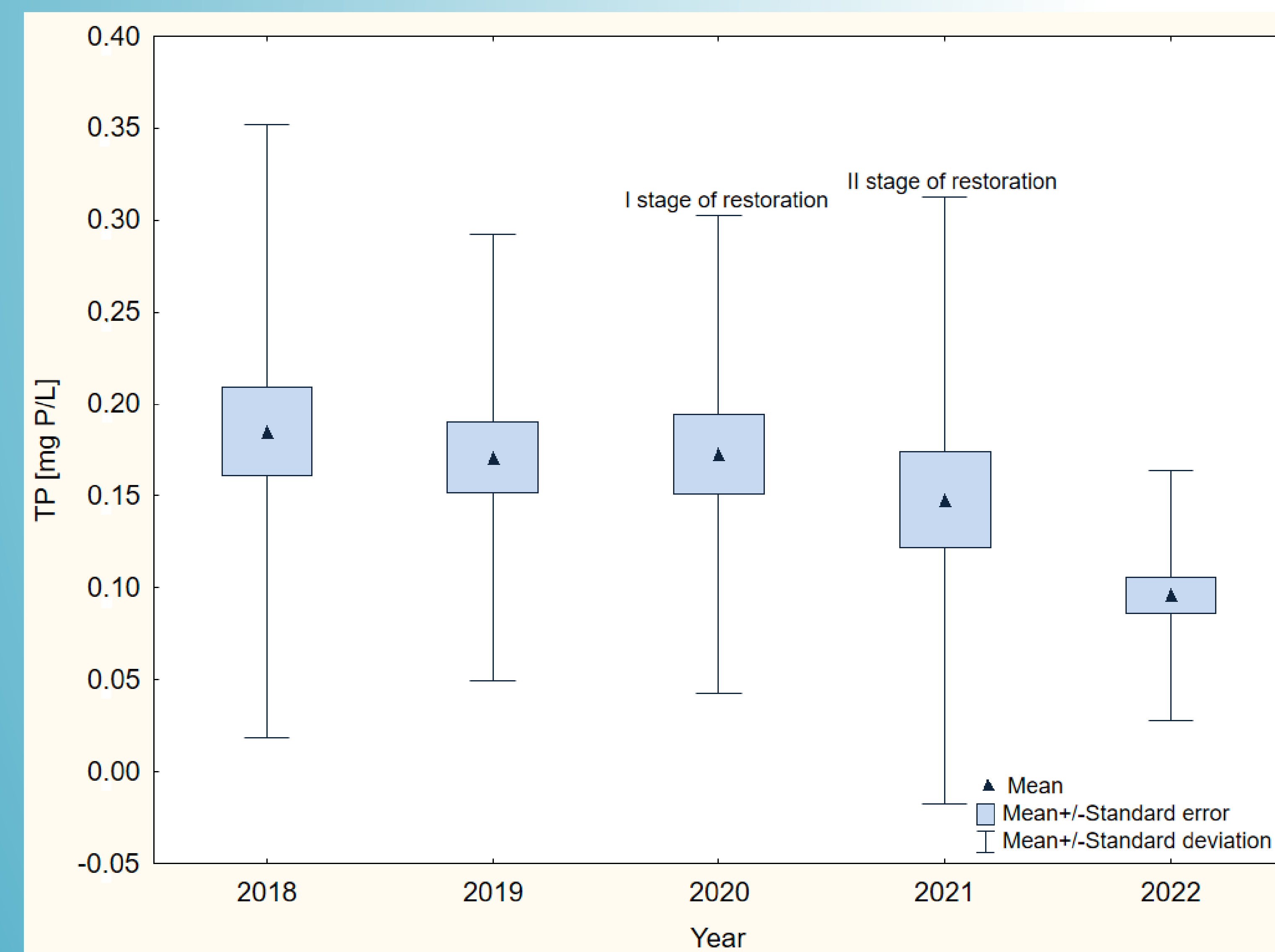
Studies on the impact of restoration using the phosphorus inactivation method on environmental conditions were carried out on Lake Mielenko (7.8 ha; 1.9 m) located in Kartuzy. Lake Mielenko is a thorough-flow water body. A small forest stream flows into it from the north-west, and the outflow is on the north-eastern shore. Lake Mielenko was a highly eutrophic water body, as it was a receiver of rainwater. After carrying out protective measures in the catchment, which consisted in cutting off the inflow of pollutants, the Kartuzy Commune decided to restoration the lake. In the spring (March) and autumn (November) of 2020 and 2021, two stages of restoration of Lake Mielenko were carried out by introducing four doses of iron PIX 111 and aluminium PAX 18 coagulants. The application of Fe and Al salts resulted in a significant decrease in the concentration of phosphates in the waters of Lake Mielenko, whose average the content was 0.015 mg/L. The TP content in the lake waters varied from 0.048 to 0.170 mg P/L. P_{org} was the dominant form in the structure of TP and accounted for about 80% of its composition. The concentrations of NH_4 in the lake waters varied from 0.000 to 0.217 mg N/L, and nitrate nitrogen from 0.085 to 0.185 mg N/L. The content of organic nitrogen varied from 0.79 to 1.59 mg N/L. As in the case of phosphorus, N_{org} was the dominant form in the composition of TN, constituting about 70-80% of its composition. TN concentrations varied from 1.10 to 1.83 mg N/L. Limited availability of biogenic compounds resulted in a decrease in primary production, which was confirmed by lower concentrations of chlorophyll a in the range from 0.53 to 36.89 $\mu\text{g/L}$. The water transparency measured by the Secchi disk visibility range, reached the bottom.



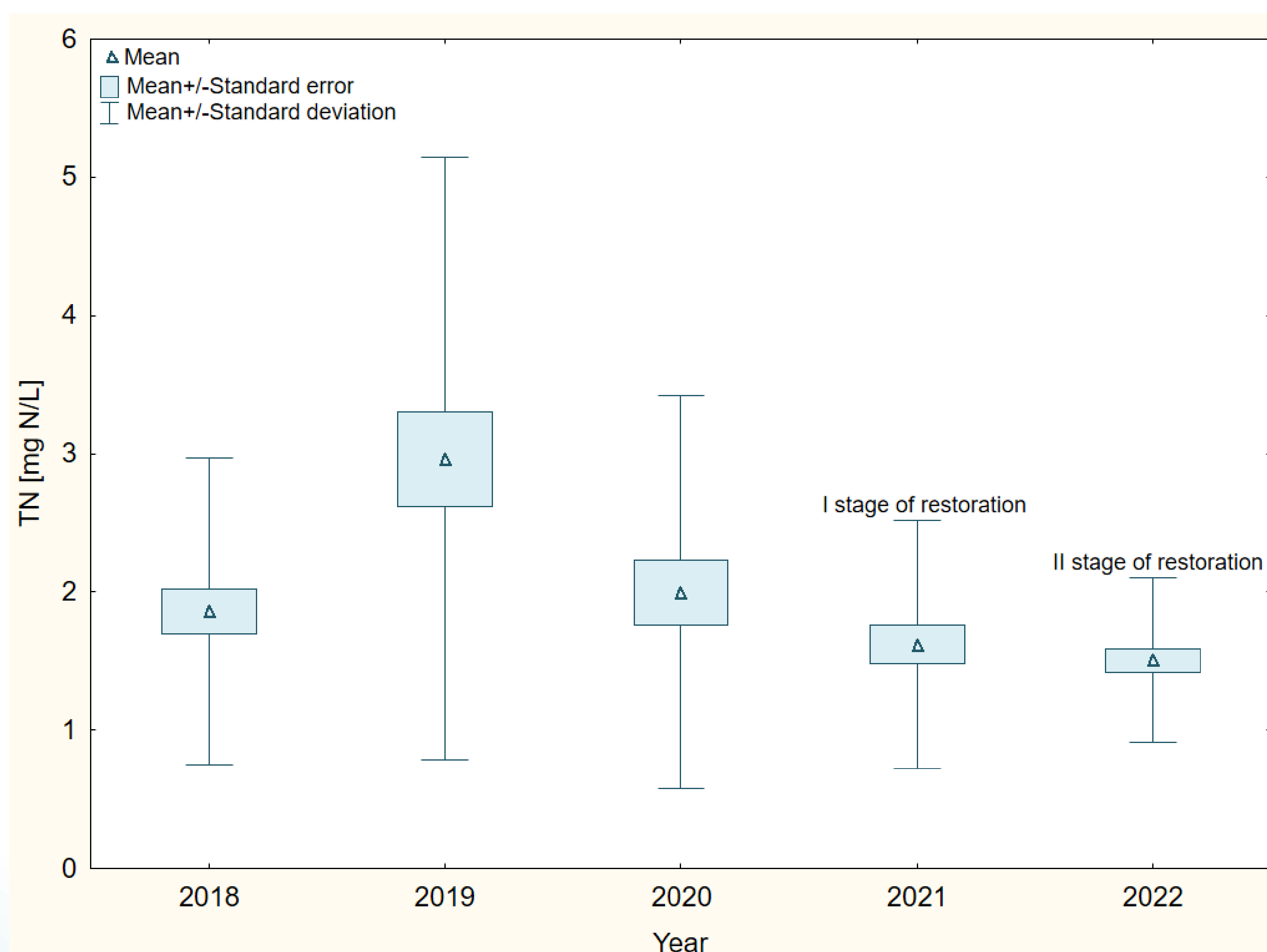
Changes of Secchi disc visibility in Lake Mielenko



Changes of chlorophyll a content in water of Lake Mielenko



Changes of TP content in water of Lake Mielenko



Changes of TN content in water of Lake Mielenko



Restoration works on Lake Mielenko (Fot. Jolanta Grochowska)