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Polymorphous formulae of esterases and transferin of two perch (*Perca fluviatilis* L.) and roach (*Rutilus rutilus* L.) populations in the Piaseczno Reservoir (an inundated sulphur mine) and the Dobczyce Reservoir

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Abstract - Polyacrylamide gel electrophoresis of the esterases and transferin in muscle of roach and perch from Reservoir Piaseczno and Reservoir Dobczyce was carried out. No differences were found between the investigated populations.

Key words: fish, lakes, genetics, electrophoresis.

1. Introduction

Biochemical fish taxonomy is widely used in the identification of populations with the phenotype unchanged though physiologically adapted to different conditions of aquatic environments (Child et al. 1976, Nyman 1966, 1970, 1971, Pawer et al. 1991, Starmach 1975, 1976, Utter 1991, Wilkins 1972, and other authors).

The aim of the present investigation was to determine the genetic differences between two populations of roach and perch from two reservoirs in Piaseczno and Dobczyce, which differ with respect to the physical and biotic conditions of their water environments.

2. Study areas

2.1. Piaseczno Reservoir

The Piaseczno Reservoir was created by filling an old sulphur mine with water. It is a deep, stratified water body with a thermocline at a depth of 2–5 m, an oxycline at a depth of 10–12 m, and the photic zone varying from 4 to 11 m. The spring and autumn mixings occur only to a depth of 15–17 m, below which is a dense, brackish, amictic layer.

The phytoplankton of this reservoir is composed of cosmopolitan species including diatoms, dinoflagellates, Chrysophyceae, and cyanobacteria. Animal plankton is represented by rotifers, cladocerans, and copepods. The density of the bottom macrofauna amounts to about 15 thousand individuals m^{-2} and is limited to the oxygenated zone, which is only 7–8 m deep during summer. Common species of the families Oligochaeta and Chironomidae are characteristic of the muddy bottom of these strongly eutrophic waters.

The reservoir has been colonized by seven fish species common in Polish inland waters, roach (*Rutilus rutilus* L.) and perch (*Perca fluviatilis* L.) being the dominants.

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2.2. Dobczyce Reservoir

The Dobczyce Reservoir was constructed for storing water for the Krakow water supply system. This eutrophic reservoir covers an area of 1000 ha and contains 125 million m^3 of water in three basins: the Myslenicki Basin is 10 m, the Dobczycki Basin 20 m, and Wolnica Bay only 5 m in depth. The phytoplankton in the greatest part of the Dobczyce Reservoir is characterized by the occurrence of cosmopolitan and ubiquitus species. Diatoms form the greatest numbers and cyanobacteria (blue-green algae) the greatest biomass. In the zooplankton, rotifers constitute the highest numbers and crustaceans the greatest biomass. In the bottom macrofauna Oligochaeta and Chironomidae dominate. The following predatory fish have been recorded: pike (*Esox lucius* L.), pike-perch (*Stizostedion lucioperca* L.), catfish (*Silurus glanis* L.), perch (*Perca fluviatilis* L.), and the asp (*Aspius aspius* L.), the only predator of Cyprinidae. The non-predatory fish are represented by roach (*Rutilus rutilus* L.), bream (*Abramis brama* L.), white bream (*Blicca joerkna* L.), tench (*Tinca tinca* L.), and, in the backwaters of the reservoir, by chub (*Leuciscus cephalus* L.) and nase (*Chondrostoma nasus* L.).

3. Material and methods

The electrophoretic separation of the enzymes A and B esterases and of transferin was carried out on 10 individual roach and perch from the Dobczyce Reservoir and 10 from the Piaseczno Reservoir. The fish from the two reservoirs were similar in total length of about 12 cm. To ensure a complete comparability of results the separation of proteins from the two investigated populations was carried out simultaneously on the same 10% polyacryloamid, Merck product. Esterases form a large group of hydrolytic enzymes

Fig.1. Electrophoretic formulae of esterases and transferin of muscles in roach and perch from the water reservoirs of Piaseczno and Dobczyce. Symbols: roach: A, B - esterases, C - transferin; perch: D - esterases, E - transferin. Of 10 investigated roaches from the Piaseczno Reservoir one individual showed the formula A, nine the formula B; of these from the Dobczyce Reservoir two showed the formula A and eight the formula B. For the representatives of the two populations the same formula of transferin was determined. In the representatives of perch the formulae of esterases and tranferin were the same.

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whose properties commonly occur in regulation processes. They also take part in protein metabolism. A special colouration was carried out using Nyman's recipe (1970) with Fast Red Salt dissolved in α and β naphthyl. Transferin, a monomeric protein, active in the transport of iron necessary for the biosynthesis of haemoglobin molecules, was coloured with Nitrozo R Salt according to the procedure described by Mueller et al. (1962).

4. Results

The results of electrophoretic separation of the esterases and transferin in muscles did not show differences between the populations of the two fish species investigated (Fig.1). In both reservoirs the roach have two esterase formulae and the perch have one. In both species transferin has one formula.

5. Discussion

Fish have a pronounced ability to adapt to various environmental conditions. Perch occurs all over Poland in running and stagnant waters, in sub-mountain and lowland rivers. Roach occurs in rivers, dammed reservoirs, and in lakes. This species also easily adapts to brackish waters, as shown by its occurrence in the coastal waters of the Baltic Sea. Thus, they are both pleiotropic species. The absence of differences between the polymorphic formulae of their esterases and transferin can be due to the fairly short time that the population in the Piaseczno Reservoir has been isolated. The two proteins are good markers of genetic differences developed through the selection of the best adapted individuals to the living conditions of a given aquatic environment.

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