MACRO- AND MICROSLAGS DELTA DEPOSITION IN THE POSTINDUSTRIAL WATER RESERVOIR IN SIELPIA (HOLY CROSS MTS., POLAND)

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The Sielpia Reservoir (Holy Cross Mountains, Poland)(Fig. 1) is one of the former post-industrial ponds, the functions of which were changed during economic transformations in the Old Polish Industrial District region [11]. The reservoir is located about 30 km NW from Kielce and belongs to the anthropogenic small-scale water retention system (ASWRS) [7]. On Czarna Konecka, many similar ponds were built as the part of the forges and other ironworks hydrotechnical infrastructure. Currently, many of these ponds have been abandoned, and some of them, just like in Sielpia, have changed their purpose for tourism and recreation. However, traces of historical metallurgical activity are still visible in the forms, but also in the lacustrine deposits. Today, sediments has been intensively transported and accumulated from the upper sections of Czarna Konecka, which in last years has formed a distinct inland delta in the reservoir bottom [3]. Before starting the hydrotechnical works in 2018, the reservoir in Sielpia in 1974 had an area of 60 ha. As a result of intensive silting, this area decreased to 55 ha in 2015 [1], [9].

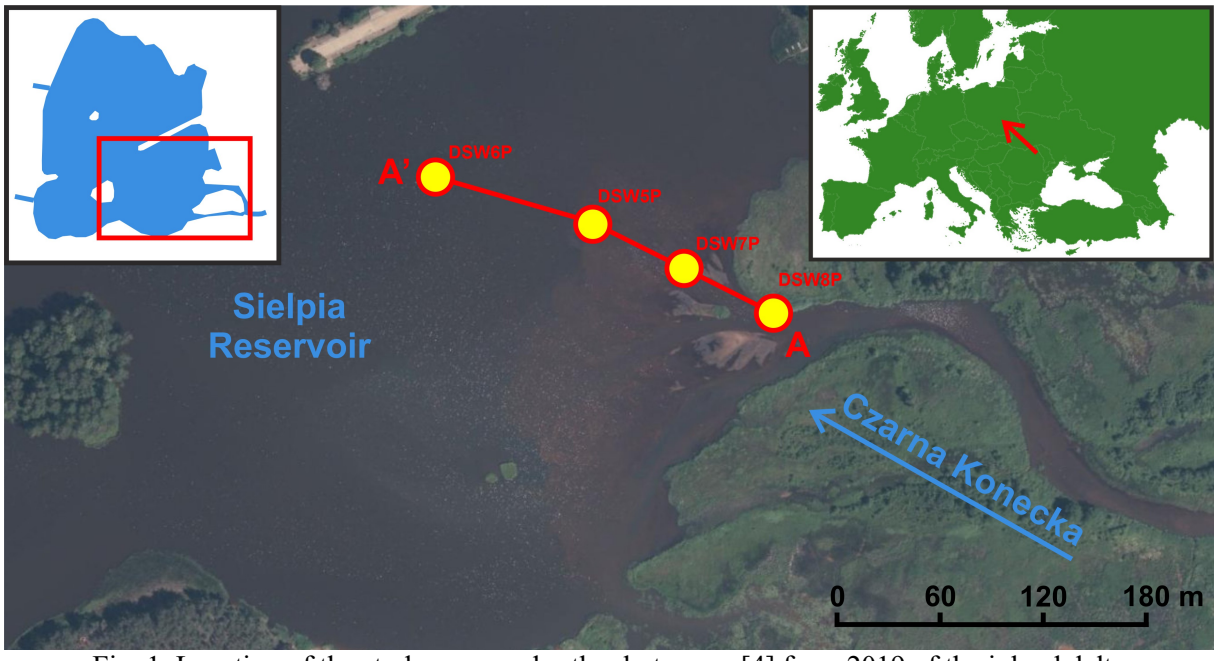

Fig. 1. Location of the study area, and orthophoto map [4] from 2019 of the inland delta in Sielpia Reservoir with profiles and longitudinal section

During the hydrotechnical works the field research were carried out in 2019-2020 on the reservoir and inland delta area. Profiles were excavated along the delta (Fig. 1) from which the material for grain-size analyzes was obtained and the Magnetic Spherule Separation (MSS) was performed [12]. A field inspection of the site was also carried out and photographic documentation was made.

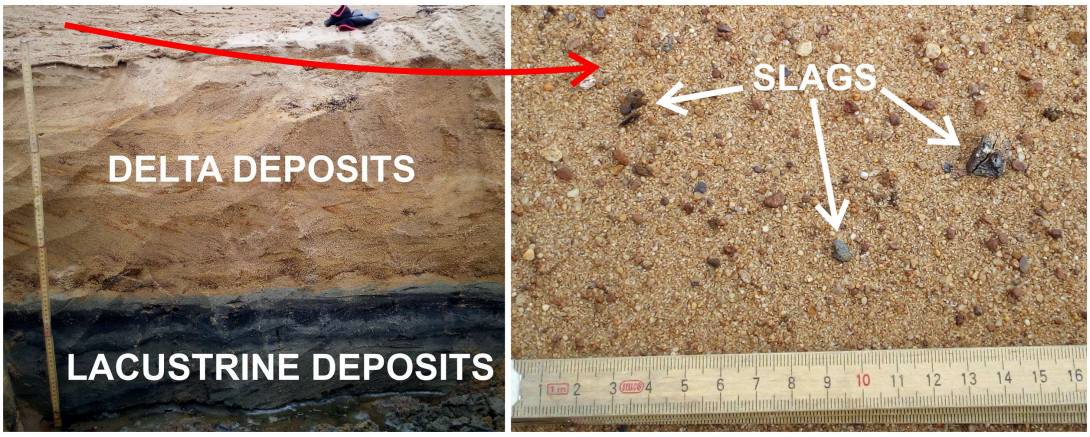

Fig. 2. DSW6P profile in the front of delta with visible dark layer of lacustrine deposits and bright inland delta deposits (left) with many small slags creating deflation pavement on the top of alluvium (right)(Photo P. Przepióra 2019, 2020)

The delta is build of sand and gravel sediments covering a darker layer of finer deposits with visible detritus inserts (Fig. 2). Among the coarse-clastic sediments there are numerous slag fragments redeposited from the upper section of the river. They also create a distinct deflation pavement on the delta surface, which shows the scale of the amount of metallurgical material deposition. Grain size analysis allowed to create a lithological delta longitudinal section, which shows 3 phases of sediment accumulation with one lacustrine sediment (I) and two phases of delta accumulation (II, III) (Fig. 3).

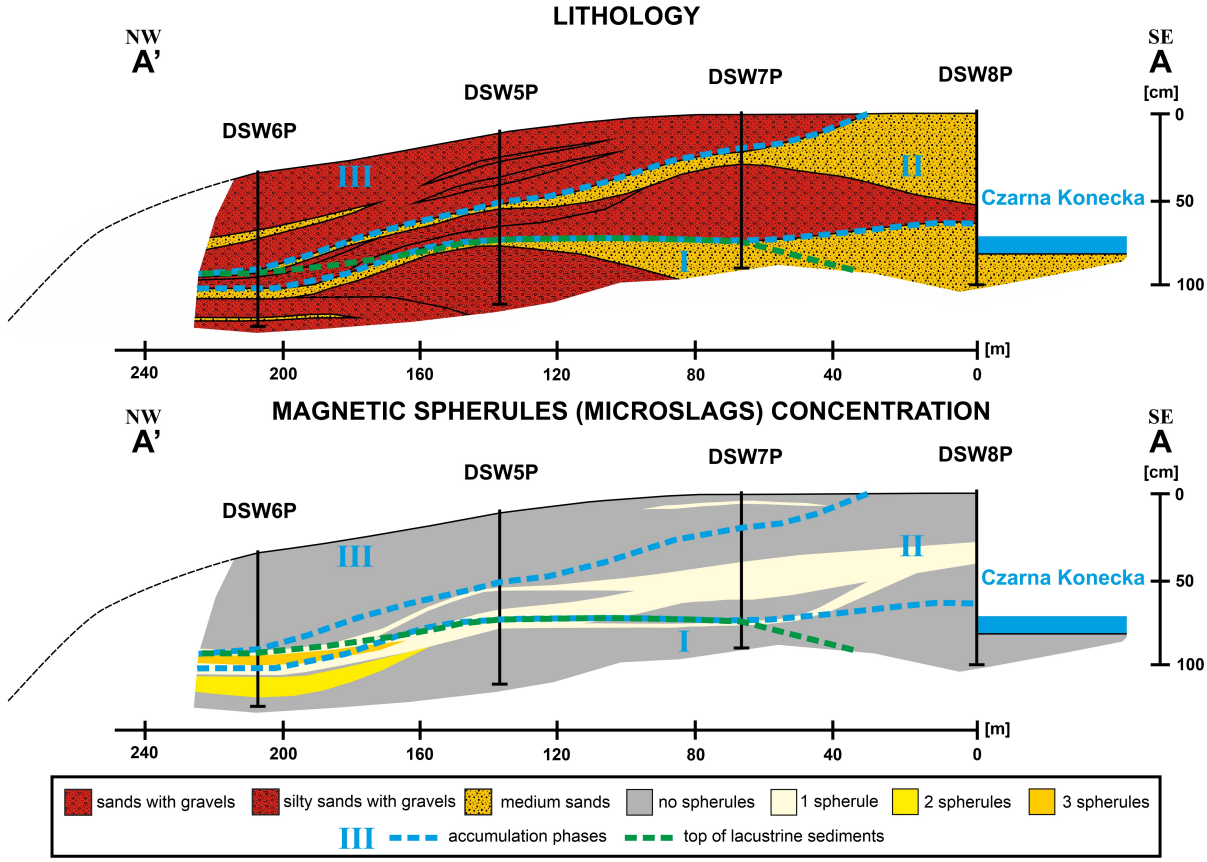

Fig. 3. Longitudinal section of inland delta with the lithology, accumulation phases and magnetic spherules (microslags) concentration (by P. Przepióra)

The MSS method was used on samples obtained from four profiles made on the inland delta (Fig. 1). Only a small amount of iron spherules in several samples of 10-20 g weight was found. They are traces of metallurgical activity of the forges in this area [2]. The small number of the spherules however was able to made an inland delta longitudinal section with a concentration of magnetic iron spherules (Fig. 3). A visible level of microslags deposition coincides mainly with the lithological accumulation phase II and some in phase I. The greatest number of iron spherules was detected in the top of lacustrine deposits and in the bottom of delta sediments (Fig. 2, 3). Just like the macroscopic slag fragments, the iron spherules occurring in the delta sediments were redeposited from the upper part of the Czarna Konecka. This material was transported during fluvial processes, which might suggest their small number in the sediments (flushed out).

Iron spherules detected in the delta sediments of Sielpia Reservoir can be mainly connected with their secondary accumulation (II). The macro- and microslags preserved in the delta's sediments was flushed out from the upper section of Czarna Konecka, where many forges were operating with similar industrial ponds (ASWRS) [11], [7]. Over time, these reservoirs were abandoned and destroyed during floods. The formed layer of iron spherules may indicate the accumulation of these sediments during one of such catastrophic events on the river during 21st c. The obtained results indicate that the MSS method has been used so far mainly in flood plains [5], [6], [10], [8] it can also be effectively used in sediments filling the bottom of former industrial ponds, including young inland deltas.

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