

**A GEOLOGICAL AND ENVIRONMENTAL EVALUATION OF “LACUL ROŞU”
(RED LAKE, EASTERN CARPATHIANS, ROMANIA)**

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“Lacul Roșu” (The Red Lake), formed in 1837, is a unique barrier lake in the inner central part of the Eastern Carpathians, being the largest natural mountainous lake in Romania, situated at 986 m altitude. Its name comes from the reddish alluvia deposited in the lake by the Red Brook, which crosses red Upper Jurassic limestones. Therefore, ferrous oxides and hydroxides accumulated in the lake sediments. The occurrence of the lake is due to the landslide of a flank of the Ghilcoș Mountain. Measurements carried out in 1987 yielded the following dimensions: a perimeter of 2,830 m, an area of 114,676 m², and 587,503 m³ as the volume of lake water.

Our investigations focused on the sedimentological features and the bathymetry of the lake, as well as on the chemistry of the surface waters, in order to evaluate its environmental state. For bathymetric investigations, the lake surface was covered by irregular network of lines, placed 10 to 20 m apart.

The flanks of the lake are slightly asymmetric, the slopes from the N and E being significantly reduced, compared to the S and W ones. The greatest depths, up to 9-10 m, were identified in the N part, close to the point where the lake discharges into the Bicaz River. In its southern part, the depth is 1 up to 3 m, while in the middle part of the lake the water depth is between 4 and 7 m.

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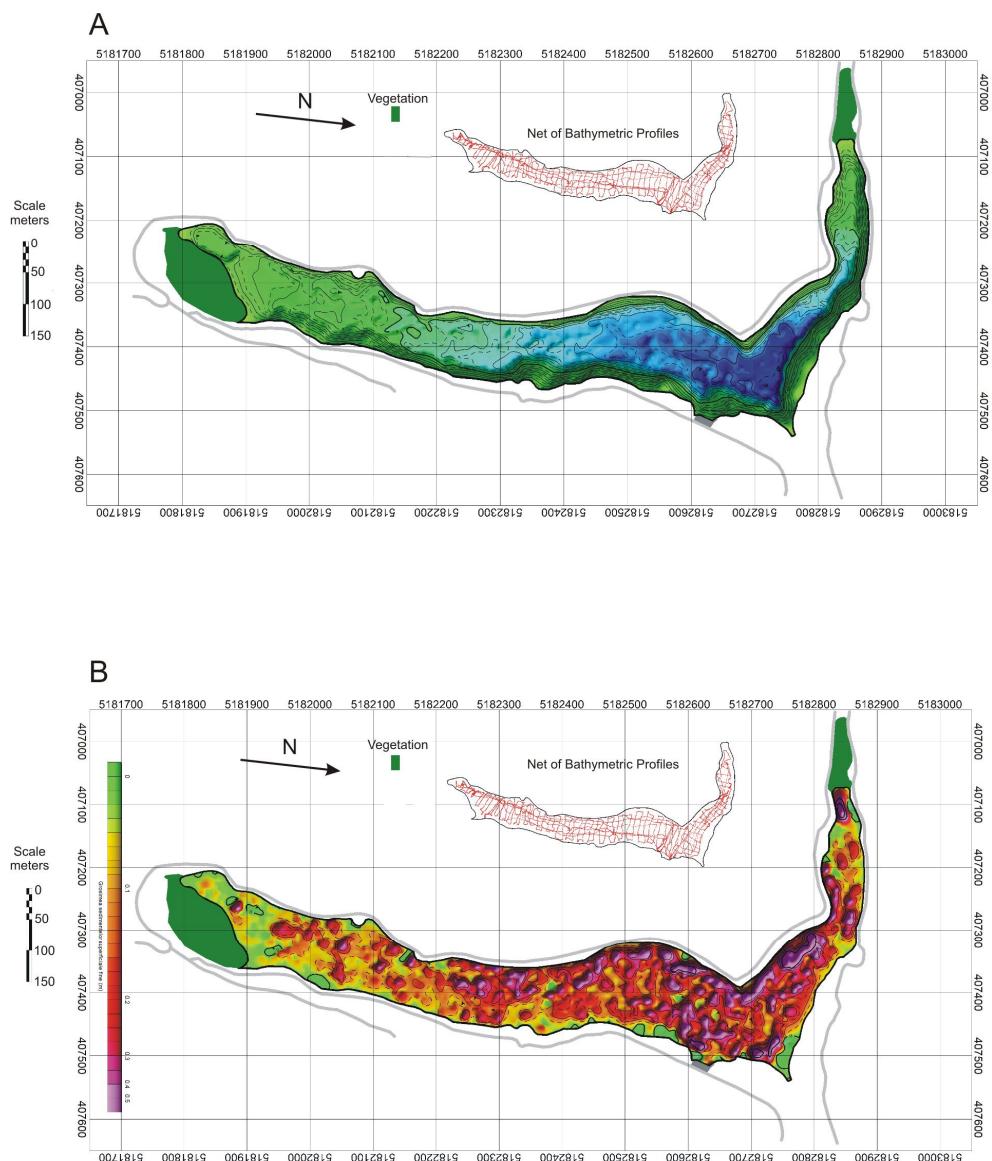


Fig. 1: A – Bathymetric map of Lacul Roșu; B – map of the thickness of the superficial fine sediments of “Lacul Roșu”.

Previous bathymetric studies indicated a maximum water depth of 10.5 m. Based on our new data, however, we may assume that a progressive silting process took place. The bathymetric map also indicated the presence, on the lake bottom, of numerous local morphological elements, most of them probably tree trunks, remains of the forest covering the area before the formation of the lake. Investigations of dual-frequency bathymetry were also able to highlight sectors of the lake where the thickness of the superficial fine sediments exceeds 0.5 m. These features were identified mostly in the N and W parts of the lake, located further from the main tributaries (fig. 1A).

Regarding the state of the lake waters, from a trophic point of view, it could be considered mesotrophic, if we take into account the PO₄ content. However, if we take into consideration the ammonium content, the state is eutrophic. As registered in June 2009, the temperature is between 12.6 and 17.7°C in surface waters, and below 5°C at 9.5 m. The pH values in surface waters are between 5.46 and 6.38, and slightly decrease with depth, yielding values between 5.14 and 6.36. The fact that most of the pH values are below 6 is indicative of a high organic content. The Eh values show little fluctuations, with values between 195 and 223 mV at the surface, and between 193 mV and 237 mV in the deepest parts of the lake.

Most of the surface of the “Lacul Roșu” bottom is covered by fine superficial sediments (with a thickness between 2.5 and 5 cm) that have been deposited since the natural closing of the valley (fig. 1B). These sediments resulted from the detritic material transported by the tributaries of the lake. An important contribution to the formation of these sediments is brought by the significant quantity of vegetal material in the region. In the southern part of the lake, where the main water and sediment sources are located, the thickness of the superficial sediments is extremely reduced. There, the sediments are mainly represented by silty sands.

Within the middle part of the lake, the thickness of the superficial sediments (established based on acoustic measurements) reached values as high as 30-40 cm. A significant thickness of the sediments was identified on the western bank of the lake, at a water depth of 5-8 m. A maximum of the superficial thickness sediments was observed in the northern sector of the lake. These sediments, having a lenticular shape, are mostly spread along the northern banks of the lake, and in the neighbourhood of the mouth of the Bicaz Valley (fig. 1B).

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