Extended Abstract

Monitoring the State of Conservation of the Mural Paintings in the Rupestral Church *Corbii de piatră* [†]

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The church carved from sandstone rock, Corbii de Piatră, dated from the 14th century, in Argeș County, faces difficult microclimate conditions. The main degradation factors are humidity (infiltration, capillarity, condensation), migration and crystallization of salts, biological contamination (favored by humidity, temperature, light), temperature fluctuations, and relative humidity. These factors led to the degradation of both the mural layer and its support, from the loss of cohesion and disappearance of the painting layer to the production of gaps in the support, with various extensions, depths, and shapes. In previous research on integrated strategy for researching the state of conservation of some cave churches to restore and enhance—case study: Corbii de Piatră, a test of biological decontamination and cleaning of the salts deposited on the mural painting and in the gaps was carried out on the northern wall of the nave [1]. After approximately 11 years, within the 5PS/2019 project, the decontaminated surface of the nave was evaluated, as well as the whole mural painting from the altar, nave, and from the iconostasis.

The state of conservation was assessed by direct in situ observations, humidity measurements, and by investigations with specific techniques (X-ray diffraction, scanning electron microscopy, and X-ray dispersive energy, optical microscopy) of the samples taken.

The temperature and humidity measurements from November 2019 to June 2020 showed maximums of 20 °C, respectively over 95%, and minimums of 4 °C, respectively 46%, comparable to those from 2007–2010. The humidity of the rock walls is high (1–2.6%, often above the detection limit of the device of 3%), and the humidity of the brick wall of the iconostasis is above the detection limit of the device. On direct in situ examination, no changes of the existing degradations on the walls and vault of the nave and the altar were observed. There has been an increase in degradation (enlargement of gaps) in the case of the iconostasis, especially in the lower area, on both sides of the entrances to the altar and places of worship to the royal icons. X-ray diffraction and electron microscopy determinations performed on the sampled crusts showed the presence of gypsum and calcite. The gypsum comes from the infiltration waters, and the calcite from the lime support of the mural (the calcite from the carbonated lime dissolves partially in the infiltration water and, in optimal conditions of temperature and relative humidity, recrystallizes on the surface of the mural). In the area with mural painting decontaminated and cleaned of salts, from the nave, the reappearance of

biological contamination was not observed under the optical microscope. With the help of the electron microscope, traces of biological contamination were observed only on the sample taken from the gap of the mural support. Due to the continuous infiltrations of sulfate-containing waters, in optimal conditions of air temperature and humidity, in the cleaned and decontaminated area, they reappeared on the edges of the fresco gypsum and calcite crust.

In the absence of solutions to improve the microclimate, the elimination of infiltration moisture, the degradation process continues through migration and crystallization of salts. Microbiological analysis of samples collected from decontaminated areas demonstrated the absence of identified biodeteriogens before decontamination. Instead, other microorganisms from the aerospore were identified. The microbial load of the samples was reduced.

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