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ABSTRACT BOOK

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New mineralogical record of guano-associated phosphates in Colombo Cave (Toirano, Liguria, Italy)

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Colombo Cave is part of Toirano karst system and opens at 247 m a.s.l. The wide entrance passage was used during prehistoric times, and a 4.5 m deep archaeological excavation pit is located 10 m from the entrance. The main room is dominated by a large central rock pillar and the floor is completely covered by important ancient bat guano deposits. Samples have beentaken in separate containers and are representative of old guano deposits and a hard-yellow crust covering the guano heap. All samples have been identified by XRD and SEM-EDS analysis.

The results indicate that old guano samples were composed mainly of calcite, quartz, spheniscidite and minor amounts of xenotime (Y), monazite, zircon, and rutile. In particular, spheniscidite $(NH_4,K)(Fe^{3+},Al)_2(PO_4)_2(OH)\cdot 2H_2O$ possibly forms from the reaction of ammonium-rich fresh guano leachates with clay sediments containing Fe and muscovite (source of K and Al) (Sauro et al., 2014). The mineral association in soft yellow and whitish crusts that cover guano is represented by gypsum $CaSO_4\cdot 2H_2O$, brushite $Ca(HPO_4)\cdot 2H_2O$, ardealite $Ca_2(HPO_4)(SO_4)\cdot 4H_2O$ and newberyite $Mg(HPO_4)\cdot 3H_2O$. Brushite and ardealite occur as cryptocrystalline aggregates varying in color from white-ivory to yellow-ivory, formed by the reaction of sulfuric and phosphoric acid with limestone rock (Hill & Forti, 1997; Puşcaş et al., 2014). Newberyite is less common and likely comes from the interaction of phosphates with Mg-bearing carbonates provided by the disaggregation of the dolomitic host rock. The identification of these minerals is important because they have never been reported from Liguria. Further investigations will be conducted in order to understand the geochemical and minerogenetic processes involved in these guano-associated minerals, and their evolution through time in the damp cave environment (Audra et al., 2019).

Audra P., De Waele J., Bentaleb I., Chroňáková A., Krištůfek V., D'Angeli I.M., Carbone C., Madonia G., Vattano M., Scopelliti G., Cailhol D., Vanara N., Temovski M., Bigot J.-Y., Nobécourt J.-C., Galli E., Rull F. & Sanz-Arranz A. (2019) - Guano-related phosphate-rich minerals in European caves. International Journal of Speleology, 48(1), 75-105.

Hill C.A. & Forti P. (1997) - Cave minerals of the world. Huntsville, National Speleological Society.

Puşcaş C.M., Kristaly F., Stremţan C.C., Onac B.P. & Effenberger H.S. (2014) - Stability of cave phosphates: case study from Liliecilor Cave (Trascău Mountains, Romania). Neues Jahrbuch fur Mineralogie- Abhandlungen (J. Min. Geochem.), 19 (1-2), 157-168.

Sauro F., De Waele J., Onac B.P., Galli E., Dublyansky Y., Baldoni E. & Sanna L. (2014) - Hypogenic speleogenesis in quartzite: the case of Corona'e Sa Craba Cave (SW Sardinia, Italy). Geomorphology, 211, 77-88.