

## **Urban underground ecosystems: a new ecological niche**

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Today more than half the world's population lives in urban areas and by 2050 two thirds will live in cities. As the urbanization steadily increases, the use of underground systems will as well. From a biological point of view subsurface urban environments are unexplored and unknown, and represents a whole new niche for ecological research.

The Kungsträdgården metro station is the deepest (~30 m) station of the Stockholm metro system and its platform walls of bare granite is the location of a unique ecosystem. The artificial light is unusual energy source in the subsurface environment and enables the occurrence of microbial communities dependent on photosynthesis with primary producers as cyanobacteria, diatoms as well as bryophytes. A plethora of organisms including Nematoda, Collembola, Crustacea, Annelida and Insecta occur on the walls, of which many species are unique for Stockholm, and even for Sweden. The microorganisms appear to play an important ecological role as they exist and facilitate specialized niches on the granite walls. Diatoms and fungi are involved in dissolution but also the formation of calcium carbonate speleothems. We identified several new lineages of 'black yeast-like fungi' (Chaetothyriales) living in a speleothem biofilm. These fungi await description, but indicate that these poorly known environments contain substantial amounts of unknown biodiversity.

We envision this project as a first step toward identifying potential infrastructural threats from an ecological perspective, and providing information that can be used by the city to create a "smart city", i.e., one that uses high-dimensional information to improve city planning, sustainability, management of the mass-transit built environment, and human health.