

Exploring microbial life in the multi-extreme environment of Dallol, Ethiopia

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The Danakil depression in the Afar region of Ethiopia, with its peculiar geographical and geological context, is one of the most extreme environments on Earth. Located in a salt desert at the confluence of three tectonic plates in the East African rift (Triple Afar Junction), the Danakil is a unique place where the transition from continental to oceanic crust (rift-to-drift process) can be observed on land. The interaction of infiltration water in the salt crust with an underneath magma chamber results in the surface in numerous hydrothermal springs. The pools and lakes fed by these hydrothermal springs show an exceptional gradient of multi-extreme conditions: negative to very low pH, warm to very hot waters and incredibly high concentration of various salts. Although there have been more than 50 years since the area was first explored, its biology remains completely unknown.

In January 2016 and 2017, we carried out the first interdisciplinary expeditions to the Dallol area intended not only to study its geological aspects but also its microbiology. We sampled the most extreme places (hyperacidic, hot, and salt-saturated), but also other environments partially influenced by the hydrothermal activity, as well as the desert evaporites and one residual hypersaline lake from the ancient enclaved sea. Our goal is to explore the microbial diversity of the Danakil depression and to better constrain the physico-chemical limits of life. Here we present our first results based on the combination of molecular analyses (16S rRNA gene sequencing), cultural approaches and microscope observations.