

Faro Lake, a big picture from a small ecosystem

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Faro Lake is a small coastal basin located by the Straits of Messina (Central Mediterranean Sea) and is the deepest basin in Sicily and one of the deepest coastal lakes in Italy. Considering the correspondence of the shorelines of the lake with half-graben faults, a tectonic event is the most likely explanation for its remarkable depth (30 m in the central region).

Due to its funnel-shape bathymetry and its limited water exchanges with the nearby sea, Faro Lake shows the typical trait of a meromictic basin, that is a persistent physical and chemical stratification of the water column. While the upper water layer is well oxygenated, chiefly due to advection processes, the bottom layer is anoxic and characterized by a vertical gradient of hydrogen sulfide concentration, reaching a maximum at the water/sediment interface. A transition zone also exists between these two layers where oxygen concentration sharply decreases with depth.

As a result of this environmental heterogeneity, a variety of ecological niches arise along the water column of Faro Lake, which are exploited by a host of prokaryote groups showing a multiplicity of metabolic pathways. These microbes, in turn, affect the chemical gradients of the water column in a complex interplay and also serve as a food source for microbial eukaryotes in the so-called microbial food web.

In summer, thanks to enhanced light availability and higher water temperature, a bloom of brown-colored photosynthetic sulfur bacteria develops in the upper part of the anoxic zone, resulting in a distinct "red water layer", coupled with significantly high biomasses of ciliated protozoa.

During my researches, I have documented and quantified the trophic interactions between phagotrophic protozoa and the prokaryotes thriving in the "red water layer". I have also found a peculiar photosynthetic sulfur bacterium and a unique bacteriochlorophyll homologue that have been retrieved, to date, only from Faro Lake and from the Black Sea. I have, finally, reconstructed the biogeography of a "flagship" protozoan species, which I have re-described from specimens collected in the lake, and I have hypothesized its introduction as an "alien" species via aquaculture activities.

In conclusion, Faro Lake is a very interesting environment and an object of research and it also represents a valuable educational model for discussing of various scientific subjects, such as geology, land/sea transition zones, biogeochemistry, metabolism, ecology, microbiology, alien species introduction, biogeography, taxonomy and a variety of related topics.