



Unexpected diversity of eukaryotes in extremes of anoxicity: The Framvaren Fjord in Norway

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The diversity of microeukaryotes and their dispersal is a central question to biology, which has been subject of controversial discussion for decades. Hitherto scientists around the world did not find a consensus on this issue. Our research focuses on this question. We study the diversity of microeukaryotes in different anoxic marine environments of our planet using culture-independent as well as culture-dependent techniques. By comparing different sample sites with each other we try to estimate the global dispersal or endemic nature of different organisms and taxonomic group. Here, we present data from an anoxic environment, the Framvaren Fjord, in Norway. With > 1000 clones analyzed thus far and more to come, our Framvaren-study belongs to the most comprehensive molecular diversity inventories in a single environment. Within a wide range of anoxicity levels, Framvaren represents the extremes of anoxicity on Earth: a super-anoxic fjord with sulfide concentrations up to 25 times higher than in the Black Sea. According to current assumptions, species diversity decreases and species abundance increases in extreme environments with only a few specialized species occurring in high numbers. However, in Framvaren, not only do we find an unexpectedly high diversity of microeukaryotes, but >95% of the molecular signatures recovered from this fjord point to either novel or undescribed organisms. The level of novelty reaches from novel species, genera and families within well described taxonomic clades, to previously described clades known exclusively from their environmental signatures, to completely novel phylogenetic lineages without any affiliation to known or described taxa. The molecular signatures we found represent organisms of most major protistan lineages in the eukaryotic tree of life. Among the novel protistan lineages discovered, 5 branch off at the base of the eukaryotic evolutionary tree. Em-

pirical estimates of our data suggest, that we only captured a portion of the protistan diversity hidden in such systems, and that we are far from revealing its true extent. The data of our project, collected at different sampling sites during the past 3 years point to the fact, that some organisms seem to be globally distributed, while others only could be found at a single study site. We will discuss anoxic marine basins as a potential cradle of speciation with local adaptation and potential “islands of evolution” surrounded by oxic barriers hardly to surmount by some organisms.