Josie Carvalho: Environmental change, temporal heterogeneity and fragmented habitats: Effects of multiple stressors on biodiversity in a model ecosystem

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Biodiversity maintenance is essential for preserve ecosystem functions and the ecology community has long focused on processes that regulate patterns of species distribution and abundance. Despite the many benefits of high biodiversity for ecosystems, it is increasingly under threat. Thence, this proposal deals with the temporal and spatial aspects of three of these threats: fragmentation, eutrophication and warming.

In short, the main goal of the project is to understand how the anthropogenic stressors of eutrophication and warming impact on biodiversity in a fragmented, patch landscape.

To achieve the objectives, we are working with four hypotheses:

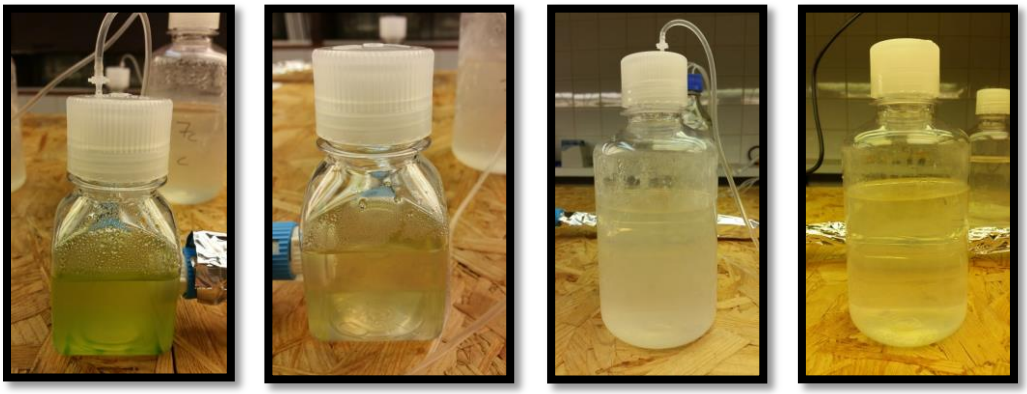
1. When nutrient addition is pulsed rather than continuous, diversity will be higher not only among autotrophs, but also in their grazers;
2. When nutrient pulses are asynchronous between patches, diversity will be higher than when the pulse is at the regional scale (pulses delivered to all patches simultaneously);
3. With higher temperatures, growth rates of algal grazers will be disproportionately higher than their prey. This will result in reduced diversity;
4. Short-term temperature increases will act as a disturbance and decrease diversity at all but the most moderate temperature spikes.

Up to now, the first hypothesis was tested and the results are being analyzed. The methods consisted of laboratory experiments; community composed by epibenthic autotrophs and species of ciliates and rotifers as their consumers; the experimental set-up was water-filled plastic basins, connected by plastic tubing (creating metacommunities); the nutrients added were P, N, Si; the number of replicates was three per treatment combination, hereafter: Pulsed/with connection (metacommunity), Pulsed/without connection, Continuous/with connection (metacommunity), Continuous/without connection; the experiment was run for 6 weeks.

Some pictures of the first experiment:

Design of the experiment

Metacommunity composed of four interconnected patches



These pictures show the visual difference of colors among the patches with different treatments. Respectively: Continuous/with connection (metacommunity); Pulsed/with connection (metacommunity); Continuous/without connection; and Pulsed/without connection.