

Algal and toxicant dispersal are key factors for maintaining biovolume production in diatom communities affected by a toxic stressor

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According to UNESCO, 50% of the marine wildlife may be on the brink of extinction at the end of this century. Stressors, such as climate change and chemical pollutants, are important drivers of this ongoing diversity loss. However, these stressors may not be the only factor affecting community composition as new species can be introduced from the surrounding communities (which is called biota dispersal). Additionally, environmental conditions can also change as pollutants are diluted in neighboring communities. Here, we examined how biota and stressor (the photosystem II-inhibitor atrazine) dispersal affected community composition when connecting a non-stressed and stressed community. To do so, we performed a microcosm experiment using 6 marine diatoms, initially added at equal densities to both communities. A full-factorial design with 5 biota dispersal levels and 4 stressor dispersal levels was applied. Dispersal was simulated by pipetting the right amount of algae/medium from one community to the other.

Community dynamics were mainly determined by 2 species: the fast growing and stress tolerant species *Asterionellopsis* sp., and the strongest competitor, but less stress tolerant species *Navicula* sp. *Asterionellopsis* sp. was the first to dominate the non-stressed community, thus decreasing diversity. Next, *Navicula* sp. started excluding *Asterionellopsis* sp., leading to an initial increase and a subsequent decrease of diversity. In the stressed community, the stress tolerant *Asterionellopsis* sp. grew fastest, decreasing diversity. Biota dispersal had no effect on diversity in the non-stressed community. In contrast, the effect of stressor dispersal changed over time, being negative first and positive at the end. This effect was caused by the suppression of the competitive dominant *Navicula* sp. Both biota and stressor dispersal had important effects on diversity and productivity in the stressed community. Because of the high input of *Asterionellopsis* sp., this species reached high abundances quickly. Consequently, diversity was lower and total biovolume higher than in the non-dispersed treatments. Moreover, the dilution of the toxicant resulted in faster growth rates of the stress-tolerant species, decreasing diversity and increasing total biovolume even more.

We conclude that

- dynamics in the non-stressed communities were mainly determined by local processes (i.e. competition);
- dynamics in the stressed communities were mainly determined by stressor effects and regional processes (i.e. dispersal);
- biovolume in the stressed community was maintained by the input of a stress tolerant species from the unaffected community, and the dilution of the toxic stressor.

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