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Dispersal of ciliated protozoa: lessons from a 4-year-experiment with environmental micro-and mesocosms

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Still, there is a widespread believe that microscopic organisms have cosmopolitan distribution because they are easily spread by, e.g., air and water. Presently, two dispersal models are discussed; viz., cosmopolitanism vs. moderate endemicity (~ 1/3 of species). Current research clearly favours the moderate endemicity model ranging from bacteria to rotifers. However, the reasons for the resticted distribution remain unclear. Several have been discussed over the years, viz., dispersal by air and water, animals, the lack of extinction, and the low weight of the resting cysts. The last reason has been disproved by Foissner (2011). But what happens with the other reasons?

This question can be tested by environmental micro- and mesocosms. Thus, I performed a 4-year-experiment using a microcosmos with 1.5 l water and two mesocosms with 6 litre and 12 litre water. The containers were placed on the south of a roof garden with vegetables. Each container was investigated monthly. As the early data showed few species and considerable extinction, I performed two kinds of controls: centrifuged container water was used as culture medium for a variety of ciliates and a chemical water analysis at end of the experiment.

Altogether, only 20 ciliate species were observed at the 25 sampling occasions: 14 in the 1.5 l microcosm, 11 in the 6 l, and 9 in 12 l mesocosms. The cumulative species number showed that the minimal areal was reached after 14 to 19 samples. Most of the species found are terricole or semiterricole, and all can produce resting cysts. Most are bacteria feeders but do not feed on cyanobacteria. The observations show repeated extinction and recolonization of the ciliate fauna. Air dispersal was dominant but low because only 20 species developed visible populations at the 25 sampling occasions. As many cyanobacteria developed, I supposed that they produced substances restricting ciliate growth. However, this was disproved by the controls mentioned above. Dispersal by animals was also observed, viz., once I saw a raven cleaning a piece of bread in the 6 l container followed by a ciliate bloom. Masses of cyanobacteria, various algae, rotifers (*Phialina roseola*), and biting midges developed frequently; especially, the insect larvae fed on the accumulating mud destroying cyst reservoirs. Island biogeography suggests the larger the area the more species. The opposite occurred in my experiment. Supported by the FWF, Project 26325-B16.