

SPECIES DIVERSITY IN TWO EXPERIMENTAL ALGAL PRODUCTION SYSTEMS IN SOUTHEASTERN PENNSYLVANIA

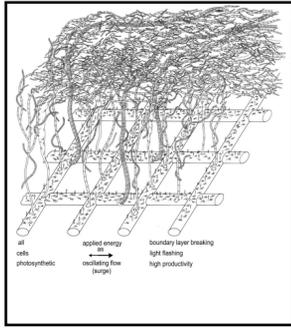
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Introduction

The algal turf scrubber is an ecologically engineered system using natural periphytic algae (algal turfs) for benefits to the environment. In the algal turf scrubber (ATS™), algae grow attached to screens in shallow troughs over which flowing water is passed. Algae in the raceways take up nutrients in their growth and are harvested on a weekly basis to remove the nutrients, thus providing water quality benefits and biomass for use in by-products.



In this study two experimental ATS™ raceways, each 0.3 m wide by 91 m long (one constructed of aluminum and one constructed of wood), were studied from summer/2008 to fall/2009. A total of 26 samples from 6 dates were taken in the aluminum ATS and a total of 22 samples were taken from 5 dates in the wooden ATS. Presence/absence data are described here as frequency of occurrence.

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Study site



Water for the ATS™ experimental systems (shown on the upper left) came from the Muddy Run Hydroelectric Facility of the Exelon Corporation, located on the Susquehanna River in southeastern Pennsylvania (shown on the upper right)

Results & Discussion

- 191 total species were found on the aluminum ATS;
- 189 total species were found on the wooden ATS;
- Species diversity was dominated by Bacillariophyta and Chlorophyta;
- Cyanobacteria were less common and several other groups were rare (Figs. 1&2)

- Fig 3. shows that most species are rare and were only found on only one date (122 species from the wooden ATS™ -63%- and 135 from the aluminum ATS™ -69%;
- Only 9 species were found on all samples dates on the wooden ATS™ (5%) and only 4 species were found on all samples dates on the aluminum ATS™ (2%).

- Fig 4. illustrates that there were seasonal successions of common species in these systems;
- Melosira varians* Agardh was frequent during all seasons, but other species peaked during particular seasons and declined during others, suggesting temporal niches perhaps due to temperature or sunlight.

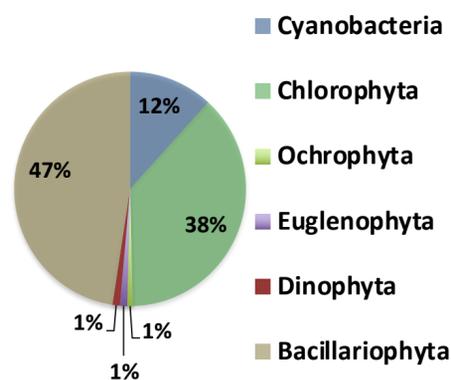


Figure 1. Cumulative taxonomic species richness of the aluminum ATS™ over the study period.

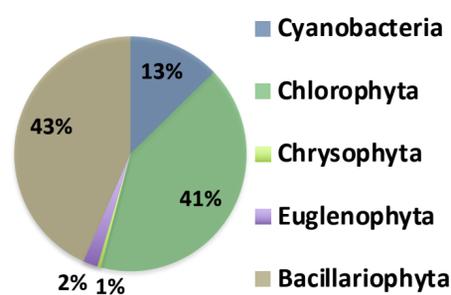


Figure 2. Cumulative taxonomic species richness of the wooden ATS™ over the study period.

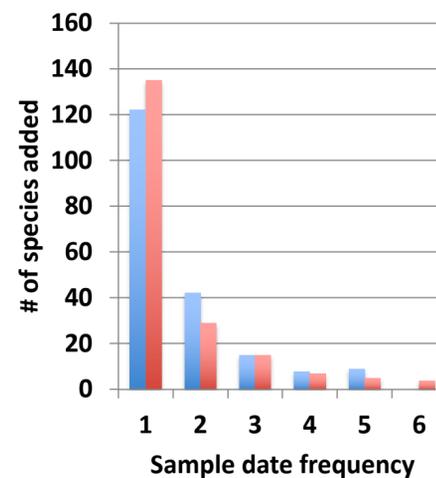


Figure 3. Sample date frequency distribution for all species found on the aluminum and wooden ATS™

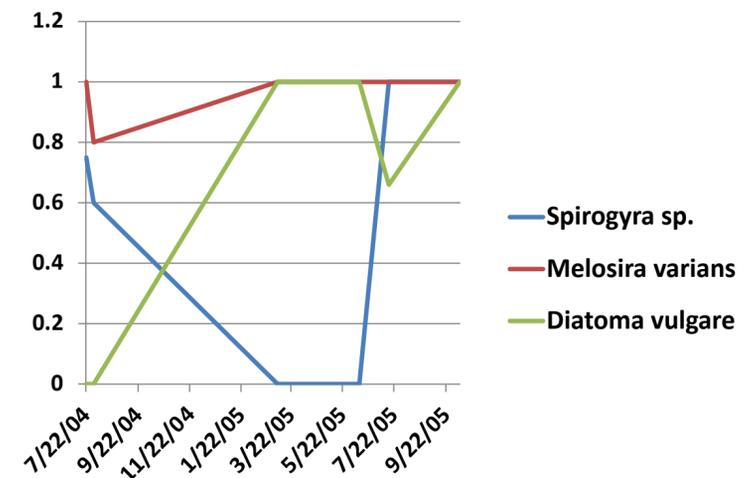


Figure 4. Seasonal patterns of frequency of occurrence of selected species in the aluminum ATS™ over the study period.

Conclusions

- Very high diversity of species were found on these relatively small experimental systems (less than 30 m²) each;
- Bacillariophyta and Chlorophyta dominated the ATS™ community, though most algal groups were represented by less common species;
- Most commonly found species were *Melosira varians*, *Ulnaria ulna* (Nitzsch) Compere, a *Spirogyra* sp. and a *Phormidium* sp.;
- High species diversity found on the systems may be because the source communities included both lotic (Susquehanna River) and lentic (Muddy Run Reservoir) environments.