Master/Bachelor thesis at University of Washington: Pink berries projects

Location:

Winkler's Lab – Civil and Environmental Engineering Department
University of Washington, Seattle, USA

Back ground:

Pink berries are the photosynthetic microbes aggregates discovered in the Little and Great Sippewissett salt marshes (Falmouth, MA), which is an intertidal pool covered by the cordgrass (Fig. 1). Pink berries sit on the sediment-water interface, having the diameter in the range up to one centimetre. The pink berries are built of a consortium of purple sulfur bacteria (PSB) and sulfate-reducing bacteria (SRB), establishing a biogeochemical cycles of sulfur within one aggregate (Fig. 2) (Wilbanks et al. 2014).

A specific aim is to study how internal storage polymers are formed and consumed with changing nutrient and light availability. In a reactor setup several parameters (e.g. intensity and duration of the photoperiod, temperature, and electron donor supply) will be manipulated online and liquid, gaseous, and solid samples will enable a complete sulfur, carbon, and nitrogen balance. The overall goal is to investigate the principles that drive the self-organization and nutrient cycling of pink berries and find what controls their structure, dynamics, and function to then connect their ecological significance to marine environments.

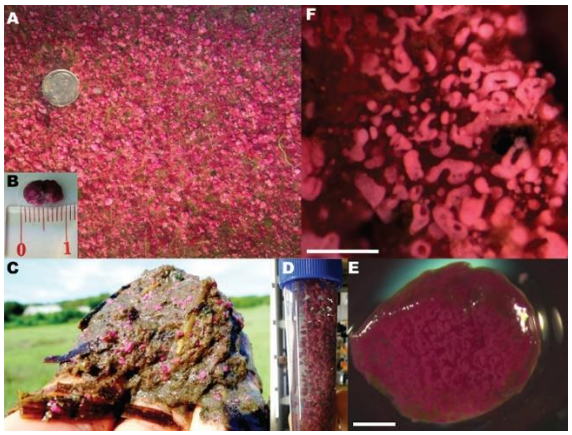

Figure 1 Pink berries. Adapted from *Wilbanks et al. 2014. A. The dense stands of pink berry aggregates in Little Sippewissett Salt Marsh; B. Large aggregates; C. Pink berries in sediment at Little Sippewissett; D. Berries in the lab; E. Cross-section of pink berry, scale bar 0.5 mm; F. Microscopic image of pink berry, scale bar 200 μm.*

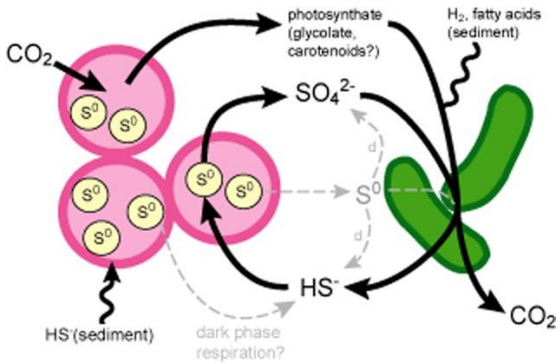

Figure 2 sulfur cycling within the pink berry consortium. Adopted from *Wilbanks et al. 2014*

Lab Tasks: The student will work with PhD student Bao Nguyen Quoc to operate the Pink berry bioreactor. Specific tasks include conducting chemical analysis, molecular techniques to assess the microbial community. Students will also be in charge of maintaining and controlling the automatic system, daily nutrient, sensor calibrations, batch tests.

General matter:
No funds will be available for salary or living expenses. University of Washington ranks 25th among world's universities. The Mercer Quality of Living Survey 2018 ranked Seattle on place 4th within US cities.

Image 1 Seattle

Image 2 Orca in Puget Sound

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References:

Wilbanks, E.G., Jaekel, U., Salman, V., Humphrey, P.T., Eisen, J.A., Facciotti, M.T., Buckley, D.H., Zinder, S.H., Druschel, G.K., Fike, D.A. and Orphan, V.J., 2014. Microscale sulfur cycling in the phototrophic pink berry consortia of the S ippewissett S alt M arsh. *Environmental microbiology*, *16*(11), pp.3398-3415.

Visual references:

First half of the following video:

https://www.pacb.com/videos/webinar-a-sulfurous-symbiosis-microscale-sulfur-cycling-in-the-pink-berry-consortia-of-the-sippewissett-salt-marsh/

Seattle's images credits:

1. https://www.fourseasons.com/seattle/
2. https://www.seattleaquarium.org/orcas