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Marine Biology with a minor in Photography

Using photography and digital software as a method to assess marine fouling communities and changes in species growth patterns

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Marine fouling communities are important, variable, and complex: They can provide valuable insight into the ecology of coastal waters. The abundance and distribution of organisms present are impacted by a variety of outside factors (Chang & Marshall, 2016). A methodology used to study these communities is to suspend settling plates from docks and remove them at regular intervals to identify colonizing organisms and monitor community development (Chang & Marshall, 2016; Altman & Whitlatch, 2007; Fuller, 2014). Species are catalogued, individuals are counted, and the percent of plate coverage may be estimated. Connell (1961) overlaid glass on plates, indicating individuals with markers and then transferring this data to paper. Fuller (2014) and Altman and Whitlatch (2007) photographed key features on plates for later reference. These methods create few physical records of the actual plates. This project looked at how photographing settling plates removed for examination might aid in the collection of data. Questions asked were: To what degree could analysis of plates be done off site from photographs and would this expand the amount of data collected by allowing more plates to be documented during field site visits? What equipment and protocols would yield adequate photographs? What is the potential value of a sharable archive of these images? Three sites along the Connecticut coast of Long Island Sound were selected, four 10 centimeter by 10 centimeter settling plates were deployed at each during the first week of June. The plates were removed and photographed weekly following consistent and repeatable protocols. Full plate and partial plate pictures were taken. A Nikon D3400 was the primary camera used for the study with a Nikon D800 periodically added to assess differences in image resolution. Some aperture and focus point variables also were assessed.

The D3400, despite having lower resolution than the D800, is sufficient for assessment. The macro lens used at f22 yielded sharper images than at f32 with negligible difference in depth of field. The use of two focus points becomes necessary when there is significant growth on the plate. The protocol established is: set a Nikon D3400 (or comparable) camera with fixed macro lenses to ISO 200, f22, and 1/125th of a second. The camera should be on a shrouded, adjustable stand. Two adjustable external flashes should be placed to the sides and set to yield proper exposures and then adjusted to bracket the exposures. The plates should be photographed while submerged in filtered water, through museum glass in contact with the water with no air bubbles. Full plate pictures should be taken by adjusting camera height and focusing the lens on the plate. Partial plate photos should be taken using a predetermined magnification on the lens and focused by adjusting the camera height. Partial plate photos should be taken with an overlap between sections to assure complete coverage. I plan to continue data collection and develop a project to analyze an aspect of the data as part of my senior thesis with a longer-term goal of publishing results in a journal.

Literature Cited:

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- Connell, J.H. 1961. The Influence of Interspecific Competition and Other Factors on the Distribution of the Barnacle *Chthamalus Stellatus*. *Ecological Society of America* 42:710–723.
- Fuller, B.J.C. 2014. Developing methods for analysis and drawing conclusions from larval settlement monitoring in Narragansett Bay: Is the timing of seasonal recruitment a driver of non-native success in the intertidal fouling community? 1:1–55.