



CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY

<b>Name(s)</b> Alexandria C. Malilay	<b>Project Number</b> <b>S0312</b>
<b>Project Title</b> Assessing Antifouling Activity of Heteractis magnifica	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> A major problem for marine industries is biofouling, the accumulation of undesirable organisms on immersed artificial surfaces. Antifouling is used to inhibit biofouling, but many antifouling coatings with metallic properties cause harm to non-target species. To prevent harm to non-target species, natural bioactive metabolites can be used in antifouling coatings. This research project focused on the sea anemone Heteractis magnifica due to past research that indicated the presence of natural antifouling agents.</p> <p><b>Methods/Materials</b> The crude extract was prepared by homogenizing the body of H. magnifica. The homogenate was immersed in acetone, ethanol, and methanol; they were then centrifuged and evaporated to dryness. For the larval barnacle assay, 10 larvae were added by micropipette to 6 replicates of 2 mL test solution. CuSO<sub>4</sub> solution was the positive control, wells with aged seawater and DMSO served as negative control, and aged sea water was the control. The plates were incubated for 24 h. The procedure was repeated with methanol, ethanol, and acetone extracts. To analyze the antifouling activity against E. coli biofilm, a 96-well multi-well plate was filled with varying volumes of acetone crude extract. Another multi-well plate was prepared with LB; 1 µL of the growth culture from the first plate was transferred to the second plate. Supernatants were removed and wells were washed using PBS and stained with 0.4% crystal violet. A microplate reader was used to analyze the plate spectrophotometrically.</p> <p><b>Results</b> The percentage of settlement and death was calculated for the acetone, ethanol, and methanol crude extract. The acetone was the most effective in inhibiting cyprid settlement and had the highest average death rate of 70%. The death rate of the cyprids for the acetone crude extract is similar to CuSO<sub>4</sub>, indicating that there are powerful antifouling agents present in the acetone crude extract. Biofilm formation was impaired in the presence of the crude extract. The absorbance decreased by about 1 nm in the presence of different crude extract concentrations.</p> <p><b>Conclusions/Discussion</b> The outcome shows potential to provide an alternate antifouling agent to coatings containing copper. The inhibitory activity of the H. magnifica extract against larval barnacle culture and biofilm formation represents an opportunity to discover active anti-macrofouling and anti-microfouling agents.</p>	
<b>Summary Statement</b> The presence of alternative antifouling agents in the sea anemone, Heteractis magnifica, was confirmed through multiple assays.	
<b>Help Received</b> I designed the methods based on academic papers I read. My lab supervisor, Dr. Malhotra, helped me understand HPLC. Dr. Daniel Rittschof and Beatriz Orihuela of Duke University provided barnacle larvae and aged sea water. Dr. Jie Li of Scripps Institution of Oceanography was my mentor.	