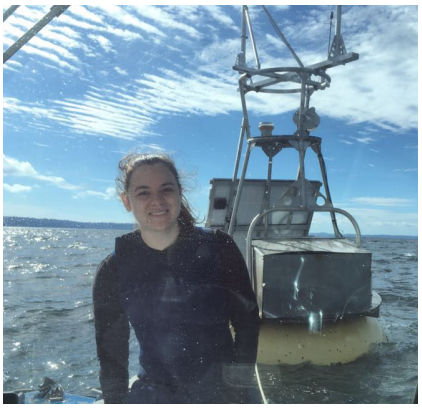
ISB Systems Education Experiences

BOEING

SYSTEMS THINKERS IN STEM



A CONVERSATION WITH:

LINDSAY ALMA

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Which systems thinking skills do you use?

#9: Identifying Relationships
By analyzing physiological outcomes, we can identify patterns and make predictions as to how organisms allocate energy. For example, if a population of shellfish had very weak shells but high growth rate, we may conclude that the population sacrificed calcification for growth based upon the oceanographic conditions they were acclimatized to.

#14: Predict Future System Behavior
Some of our study locations experience very harsh and corrosive conditions which often exceed the predicted year 2100 conditions for the open ocean. By acclimatizing our shellfish to these extreme conditions, we may make predictions as to how these animals may fare in the future.

#15: Respond to Changes Over Time
As the environment changes due to climate change, we have to stay up to date on the latest data and predictions to design accurate experiments.

1. **What is your role within the STEM community?**
   My research focuses on shellfish aquaculture and climate change in the Pacific Northwest. I also TA STEM-based lab classes in marine biology.
2. **What complex problem do you address in your work?**
   My research seeks to address the question: how do environmental stressors affect the physiology of important shellfish species? As climate change progresses, stressful conditions in the ocean become increasingly intense and may cross physiological thresholds. These conditions can cause serious damage to shellfish, namely those that are used in the shellfish aquaculture industry or for restoration purposes. By analyzing the health, fitness, and energy allocation of shellfish at multiple life stages, we can make predictions as to how these species will fare in the future.
3. **What elements do you need to consider when addressing this problem?**
   In my research, I consider a broad range of physiological parameters at various life stages to get a holistic snapshot of overall fitness. My primary PhD project considers the performance of two species, Mediterranean mussels and Olympia oysters, at four locations within Puget Sound, WA. We monitored oceanographic parameters in these locations in order to link physiological performance of the organisms with oceanographic stressors over one year. We also considered trans-generational plasticity by spawning our oysters to see if larval performance was affected by the location and conditions in which their parents matured. We considered multiple physiological parameters in our analysis of the adult shellfish including shell strength, fatty acid content, stable isotopes, and growth. By analyzing these parameters, while considering the oceanographic data, we can make predictions on the energy allocation and stress experienced by the shellfish.
4. **How did you get where you are today?**
   Before going to grad school, I did my undergraduate degree at UCLA in Environmental Science. At the same time, I worked with the City of Los Angeles Recreation and Parks Department where I ran a summer camp. This experience prepared me for grad school by giving me the leadership and organizational skills to succeed. After graduating, I spent two years doing as many internships as possible to build my resume. After two years, I applied to grad school to get my masters degree. I loved grad school and the work I was doing so much that I decided to proceed to get my PhD. I am currently in my fifth year of grad school and plan to graduate with my PhD in one year.
5. **What advice do you have for becoming a systems thinker?**
   I highly recommend looking for internships where you can get hands-on experience in the system you wish to study. By seeing, touching, and immersing yourself in your field of interest, you naturally get a grasp of the system.