Researchers provide new details about sea stars' immunity

July 28 2015, by Bridget Lewis

Wasting disease affects nearly 20 different species and it has caused up to almost 90 percent mortality in some areas off the West Coast over the last two years. Credit: Lauren Fuess/UT Arlington

A study led by a University of Texas at Arlington graduate student examining sea stars dying along the West Coast provides new clues about the starfish's immune response and its ability to protect a diverse coastal ecosystem.

Lauren Fuess, a Ph.D. candidate in quantitative biology, and her team looked at the wasting disease responsible for the largest die-off of sea stars ever recorded. Scientists believe that a virus related to rabies causes wasting disease. When infected, the stars' arms contort, and they develop white lesions. The normally rigid stars begin to melt and become squishy in the final stages of the disease.

Wasting disease affects nearly 20 different species and it has caused up to almost 90 percent mortality in some areas off the West Coast over the last two years.

"The sea stars protect the rocky shores, keeping them from becoming dominated by mussels," Fuess said. "When you remove the sea stars, you see dramatic declines of other species, so basically you go from a diverse ecosystem to a mussel-coated beach."

The team researched the project looking at transcriptomes, or the molecules expressed from the genes, of sea stars infected with wasting disease as part of an Ecology of Infection Marine Disease course last summer at Friday Harbor Laboratories at the University of Washington.

Fuess, who recently received a National Science Foundation Graduate Research fellowship, works in the laboratory of Laura Mydlarz, a UT Arlington associate professor of biology.

"We're looking at an increasing rate of diseases that may be linked to climate change as well as pollution in the ocean," Mydlarz said. "What we're working on at our field sites and here at UT Arlington is looking to see if some of this temperature stress due to climate change or pollution are causing the animals, such as the sea stars and the corals, to be more susceptible to diseases.

"Lauren's research here is a great example of student excellence in this area."

The team found that the sea stars have an immune response that is characterized by various types of immunities and that they have multiple aspects of the toll-signaling pathway, which is an important recognition.

"It's how a cell recognizes a pathogen and then elicits a change in its

genes so that the sea star can start defending itself against the pathogen," Fuess said. "We found a lot of interesting genes - including the first melanin gene ever recorded in a sea star. Invertebrates can use melanin to wall off pathogens or any bacteria-like viruses that are attacking them."

The team also found several changes in the extra cellular matrix and collagen gene.

"Genes that degrade collagen, which is a component of the sea stars' structure, were being increased in the stars we studied," Fuess said. "So, you have more degradation of that essential collagen and breakdown of the matrix that is used for their movement and rigidity. We also saw changes in nervous genes that might be contributing to that twisting of the arms."

More information: The title of the new study is "Up in Arms: Immune and Nervous System Response to Sea Star Wasting Disease." The paper was published online this month by the journal *PLOS ONE* and is available here: journals.plos.org/plosone/arti … journal.pone.0133053

Provided by University of Texas at Arlington

Citation: Researchers provide new details about sea stars' immunity (2015, July 28) retrieved 20 September 2024 from https://phys.org/news/2015-07-sea-stars-immunity.html

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