SCTLD-associated Symbiodiniaceae ITS-2

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Project
» A multi-scale approach to predicting infectious multi-host disease spread in marine benthic communities (Multi-scale multi-host disease spread)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **Lat**:0 **Lon**:0

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Parameters

Parameters for this dataset have not yet been identified

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Project Information

A multi-scale approach to predicting infectious multi-host disease spread in marine benthic communities (Multi-scale multi-host disease spread)

Coverage: United States Virgin Islands

NSF Award Abstract:

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Marine diseases have devastating impacts on ocean ecosystems and this work will directly examine the framework for understanding disease transmission in the ocean. A team of ecologists, ocean connectivity and disease modelers, microbiologists, and coral immunologists (from the University of Virgin Islands (UVI), Louisiana State University (LSU), Rice University, University of Texas-Arlington and the Woods Hole Oceanographic Institution) will develop a model that predicts transmission of a devastating Caribbean coral disease that has the potential to impact the economic value of coral reefs, including those located in the U.S. This project will support multidisciplinary field and laboratory research experiences of graduate students at multiple minority-serving institutions, and will provide undergraduate students with hands-on training in modeling, ecological and molecular analysis techniques. UVI and LSU are in EPSCoR jurisdictions and have diverse student bodies, including numerous under-represented minority (URM) students. The research team will collaboratively provide URM students with research experiences in STEM fields. Project findings will be broadly communicated through virtual public programming, and through the Virgin Islands Coral Disease Advisory Committee with updates on the vicoraldisease.org website. A coral disease response workshop for the U.S. Virgin Islands will also be held, in which project results will be presented and used to support disease response planning.

Over the last four decades, marine diseases have decimated ecosystem engineers in marine coastal ecosystems, including the rocky intertidal, seagrasses and coral reefs. The pathogens driving these diseases have frequently been challenging to isolate, characterize and confirm, in part because they affect multiple host species and can spread by ocean currents, as well as through individual contact. Here, we propose a multi-scale epidemic model for studying marine disease that addresses both within-host and within-patch disease dynamics, and explicitly acknowledges the dispersal of pathogens between populations. Our interdisciplinary research team of ecologists, connectivity and disease modelers, microbiologists, and coral immunologists will integrate the largest set of predictors of marine disease spread to date: individual host species traits that allow for disease resistance or susceptibility, local transmission within communities that may have unique community structure, and hydrodynamic connectivity among susceptible communities. Modeling will be supported with rich data sets of within- and among-patch population characteristics and disease dynamics as well as molecular data on species-level disease responses. This project will advance knowledge of infectious diseases by integrating multidimensional scales and differential host susceptibilities into existing epidemiological models. This model will particularly advance the framework for studying marine diseases and has the potential to elucidate the transmission properties of a devastating Caribbean coral disease (stony coral tissue loss disease) that fits the most confounding and notorious hallmarks of marine diseases: infection of multiple hosts by an elusive pathogen.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2109622

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